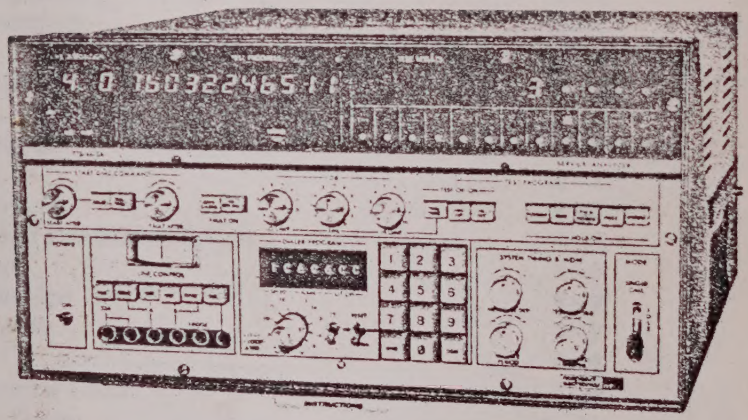
MODEL 41-3A
CENTRAL OFFICE SERVICE ANALYZER

INSTALLATION AND OPERATION



Electronic Services - Los Angeles
M13581X

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Northeast Electronics Instruction Manual
A0041-13-600 Issue 1 September 1977

northern telecom

3.0C-0379

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SECTION 1

GENERAL DESCRIPTION

1.1 This manual describes the Northeast Electronics Model TTS 41-3A Service Analyzer. The analyzer is a comprehensive instrument that combines the many functions of a routiner, automatic dialer, and call-through test set.

1.2 The analyzer has a large selection of programmable test and failure analysis capabilities. It can be programmed to:

a. automatically dial a number assigned to its own internal test line (or dial the number of any other test line);

b. analyze the progress and results of each call attempted;

c. store the number of calls attempted and the number of calls that tested OK . . . plus the number of failures in up to 12 different categories for calls that did not test OK;

d. display the stored numbers.

1.3 Programming is selected by front panel controls. Status data and test results for each call are displayed as lighted messages on a dark panel background. Test result total counts are displayed on a digital readout.

1.4 The analyzer can be programmed to halt automatic operation and hold switched connections for troubleshooting when specific types of failures are detected. Or, programming can allow automatic calling to continue in order to collect and tabulate data on overall office performance.

1.5 ORIGINATING LINES

1.6 Up to 16 telephone lines can be connected to the analyzer for test call origination. Connections are made via rear-panel type 310 jacks. Call origination lines can be either 600 or 900-ohm 2-wire circuits (T/R or T/R/S).

1.7 The analyzer has two channels. Up to 8 of the originating lines can be connected to channel A, and up to 8 lines can be connected to channel B.

1.8 Programming specifies whether calls will originate on channel A lines only, channel B lines only, or will alternate between channel A and B lines. In all cases, the analyzer automatically scans and checks for idle/busy until an idle line is found. Automatic calling can continue on one channel even when the other channel is stopped for tracing and troubleshooting on a failed line.

1.9 A distinctive trace tone can be coupled onto a line held by the analyzer to aid in trouble location. A talk circuit and jacks for a type 52A headset allow voice communication over a held line. External test equipment may be connected through an external jack on the analyzer for either bridged or terminating connection to a held line.

1.10 BUILT-IN TEST LINE

1.11 The TTS 41-3A has its own internal test line that can be wired to an incoming telephone circuit to receive calls placed by the analyzer. Thus, operation of the analyzer need not tie up any regular telephone office test lines.

1.12 The built-in test line can be tripped to off-hook by a 20 to 60-Hz ringing signal across its T/R leads. When tripped by ringing, the test line couples a 1-kHz tone to the circuit for transmission tests. The sleeve can be monitored, and a potential more positive than −7 volts or an open is considered an active (busy) lead.

1.13 When calls are programmed to the internal test line, a TEST OK is recorded for each call that successfully trips the test line within a programmed NETWORK DLY period after dialing, only if an active sleeve is detected. If the incoming circuit has only T/R leads (no sleeve lead), successful tripping of the test line is all that is needed for a TEST OK. Also, the unit can be made to record a TEST OK if an active sleeve only (no T/R leads) is detected within a programmed NETWORK DLY period after dialing.

1.14 FAILURE TABULATION

1.15 The following types of call completion failures can be programmed for detection and tabulation.

a. no (or slow) dial tone, or (on an optional basis) no wink-type start dial signal;

b. open C-lead after line seizure;

c. false T/R reversal supervision during dialing (discloses reversed wipers in SXS switch trains and faulty message accounting equipment);

d. reorder;

e. busy;

f. reorder and false answer supervision;

g. busy and false answer supervision;

h. no answer supervision within programmed period after dialing;

i. incoming circuit fault . . . call did not reach internal test line within programmed time period after dialing;

j. no 1-kHz tone received from a dialed signal source;

k. 1-kHz tone received from signal source deviates from programmed expected measured level (EML) by more than a programmed LO LIMIT . . . discloses excessive transmission loss;

l. 1-kHz tone received from a signal source deviates from programmed EML by more than a programmed HI LIMIT. . . discloses attenuation pad problems and/or excessive gain.

1.16 The analyzer can store up to 9999 counts for each failure category. Pressing a button for a desired category displays the count on a digital readout. The analyzer also counts and can display the number of: (a) total calls attempted, (b) total calls attempted on channel A lines, (c) total calls attempted on channel B lines, and (d) calls that tested OK.

1.17 If the count exceeds 9999 in the total tests category, an OVER RANGE message appears. After the count for any category goes over range, the count number displayed for that category shows count excess above 10,000. Counts in all other categories are unaffected.

1.18 DIALING PROGRAMMING

1.19 Panel controls permit programming either dial pulse (DP), Touch-Tone (TT) or optional multifrequency (MF) dialing and either of two start dial commands. A DELAY start dial command will initiate dialing when a programmed START AFTER period has elapsed following line seizure. A DIAL TONE start dial command will initiate dialing after receipt of dial tone following line seizure.

1.20 On analyzers equipped with multifrequency dialing, selecting the DIAL TONE start dial program conditions the unit to begin dialing upon receipt of either dial tone or wink (or similar start dial signal). Failure to receive dial tone (or wink) within a programmed FAULT AFTER period is recorded as a NO DIAL TONE fault.

1.21 The dialing number to be called is entered via a front panel keyset and is displayed on a digital readout at half brightness. After the analyzer dials out each digit during a test call, that digit is brought up to full brightness on the readout. Thus, any call completion failure detected during dialing can be pinpointed to a particular switching level by noting the relationship of half-bright to fully-bright dialing digits on the readout.

1.22 Special wait for start dial (WSD) commands can be programmed among the numeric dialing digits. The analyzer stops dialing and waits for a start dial indication (DELAY or DIAL TONE) at each point in the dialing number where a WSD command has been programmed. Thus, the analyzer can be programmed to dial through PBX-type equipment.

1.23 Up to 15 numeric digits and WSD commands can be programmed. The digital readout displays up to 11 of the numeric digits. WSD commands are not displayed.

1.24 Other parameters of the dialing signaling can also be programmed over wide limits to exercise switching equipment under various conditions. Digital thumbwheel switches select:

a. dialing speed from 1 to 99 pps (DP) in 1-pps increments, or 1 to 99 digits per second (TT and MF) in 1 digit per second increments;

b. percent break (DP) or percent tone (TT and MF) from 1 to 99 percent in 1-percent increments;

c. interdigital time (DP only) from 1 to 999 milliseconds in 1-millisecond increments. Different loop resistance and line leak values can be independently selected for DP calls.

SECTION 2

SPECIFICATIONS

2.1 Table 2–1 lists specifications for the Model TTS 41-3A Service Analyzer.

Table 2–1. Model TTS 41-3A Service Analyzer Specifications

ORIGINATING LINES	
Line Capacity:	Up to 16 lines, 8 lines maximum on each of two channels; lines connect to type 310 jacks on rear panel.
Line Type:	Wet loop type; T/R leads for dedicated circuits, T/R/S leads for non-dedicated circuits with ground control on S lead. Line impedance can be either 600 or 900 ohms.
Sleeve Lead	
Busy Condition Recognized:	Ground or any potential more positive than –7V.
Idle Condition Recognized:	Open circuit or any potential more negative than –11V. 4V of hysteresis provided to prevent indecision.
Circuit Busy-to-Reselect Circuit Time:	100 ± 1 ms.
Line Seizure (off-hook):	Active hold. 15 mA while test results are being determined; 25 mA othertimes.
DIALING	
Type:	Dial pulsing (DP) or Touch-Tone (TT); multifrequency (MF) dialing is optional.
Digit Capacity:	Up to 15 digits and instructions for programmed wait-for-start dial (WSD) stops. Entered numeric digits are displayed on test progress readout.
Digit Entry:	Front panel keyset enters the digits, WSD instructions and end of number (EON) instruction.
Dial Pulsing	
Dial Speed Range:	Selectable 1 to 99 pps in 1-pps increments.
Dialing Speed Accuracy:	± 0.1% for 1 to 30 pps range.
Percent Break Range:	1 to 99% in 1% increments.
Percent Break Accuracy:	± 1% for 35% to 85% percent break range over a 1 to 30 pps dialing speed range.
Interdigital Time Range:	1 to 999 ms in 1-ms increments.

Table 2—1. (cont'd)

Interdigital Time Accuracy:	Better than ± 1 ms.
Transient Suppression:	325 ± 25 Vdc.
Touch-Tone Dialing	
Frequency:	Pair of frequencies, one from a low frequency group and the other from a high frequency group.
Frequency Accuracy:	± 1%.
Single Frequency Harmonic Distortion:	Less than 3% over a 30-kHz bandwidth.
Single Frequency Output Level:	−6.0 ± 0.5 dBm into 900 ohms.
Dialing Speed Range:	1 to 99 digits per second in 1 digit per second increments.
Dialing Speed Accuracy:	± 0.1% for 1 to 30 digit per second range.
Tone Duration Percentage Range:	1 to 99% in 1% increments.
Tone Duration Percentage Accuracy:	± 1% for 35% to 85% tone duration range over 1 to 30 digit per second dialing speed range.
Multifrequency Dialing (optional)	
Type:	Standard R1 MF pulsing. KP and ST tones transmitted at the proper times.
Frequency Accuracy:	± 1%.
Single Frequency Harmonic Distortion:	Less than 3% over a 30-kHz bandwidth.
Single Frequency Output Level:	−6.0 dBm ± 0.5 dB into 600 ohms.
Dialing Speed Range:	1 to 99 digits per second in 1 digit per second increments.
Dialing Speed Accuracy:	± 0.1% for 1 to 30 digit per second range.
Tone Duration Percentage Range:	1 to 99% in 1% increments.
Tone Duration Percentage Accuracy:	± 1% for 35% to 85% tone duration range over 1 to 30 digit per second dialing speed range.
Twist:	1 dB or less.

Table 2—1. (cont'd)

DETECTION CRITERIA

Answer Supervision:	Recognizes T/R lead reversal lasting longer thar approximately 312 ms.
Open C-lead:	Recognizes, if instructed, loss of C-lead ground lasting longer than 512 ms. After open C-lead recognition occurs, supplies up to approximately 180 mA sleeve current in an attempt to hold switched connections.
1-kHz Level Detector	
Frequency Range:	990 to 1020 Hz.
No Tone Threshold:	−31 ± 1 dBm from 900/600 ohms.
Response Time:	2 ± 0.5 seconds.
Level Limit Accuracy:	± 0.5 dB from +10 to −10 dBm. ± 1 dB from −11 to −31 dBm.
Busy/Reorder Detector	
Frequency Range:	200 to 650 Hz.
Sensitivity:	−30 dBm from 900/600 ohms.
Busy Pulse Modulation Rate:	45 to 75 ipm.
Reorder Pulse Modulation Rate:	100 to 140 ipm.
On/Off Level Ratio:	Greater than 6 dB.
Number Of Interruptions:	3 for busy tone, 6 for reorder tone.
Tone On Duty Cycle:	20 to 80%.
Wink/Delay Dialing Detection: (multifrequency equipped units only)	Reversed tip/ring polarity present on the line under test for at least 128 milliseconds followed by a return to normal polarity that lasts for at least 128 milliseconds. The line under test can be in either the normal or reversed state prior to seizure.

INCOMING CIRCUIT TEST LINE

Pre-Trip Impedance:	Approximately 47 kohms at 20 Hz.
Trip Impedance:	Approximately 850 ohms at 20 Hz.
Trip Criteria:	20-60 Hz ringing voltage across T/R leads at 65 volts rms or greater.
Quantity Of Rings To Trip:	1 lasting for more than 600 ms.

Table 2—1. (cont'd)

Sleeve Active (Busy) Condition Recognized:	Open Circuit, ground, or any potential more positive than −7V.
Sleeve Inactive (Idle) Condition Recognized:	Any potential more negative than −15V. 8V of hysteresis provided to prevent indecision.
Signal Output:	1004 ± 10 Hz at 0 dBm into 900 ohms.
INTERNAL TRACE TONE	
Frequency:	1165 ± 500Hz, gated on/off at 4 Hz rate (240 ipm).
Tone-On Level:	Approximately 0 dBm into 900 ohms.
Loop Holding Resistance:	900 ± 90 ohms dc.
DATA STORAGE	
16 Data Registers:	0 total tests. 1 tests on channel A. 2 tests on channel B. 3 no dial tone (and/or no wink). 4 open C-lead. 5 reversal during dialing. 6 reorder and answer. 7 busy and answer. 8 reorder (and no answer). 9 busy (and no answer.) 10 low level. 11 no 1-kHz tone. 12 high level. 13 no answer. 14 incoming circuit fault. 15 test OKs.
Storage Capacity:	9999 events per register, instant recall via individual readout switches. Over range indication if a register count exceeds 9999 (total tests register) without affecting contents of other registers.
INPUT POWER:	105 to 120 or 215 to 240 Vrms, 50 to 60 Hz, approximately 60 watts.
OPERATING ENVIRONMENT	
Temperature:	+32°F to +122°F (0°C to +50°C).
Humidity:	0% to 90% relative.
MECHANICAL	
Size:	9 in. h x 17 in. w x 18 in. d (23 cm x 43 cm x 46 cm).
Weight:	Approximately 40 pounds (18.2 kg).

SECTION 3

INSTALLATION

3.1 This section provides the information needed to install the Model TTS 41-3A Service Analyzer and to verify its operating condition after shipment.

3.2 VISUAL INSPECTION

3.3 After unpacking the unit, check to see that it has been shipped with an 8-foot, 3-wire ac power cord. Examine the exterior of the unit for visible damage caused by shipment. It is not necessary to inspect the unit's interior.

3.4 MOUNTING

3.5 The analyzer is a portable instrument and can be placed on any convenient work table surface or shelf. The analyzer does not come equipped for permanent rack mounting. If it is desired to mount the analyzer in a rack, a shelf should be mounted in the rack to hold the analyzer.

3.6 Figure 3–1 shows the analyzer's major dimensions. Note that clearance of at least five inches is required in back of the analyzer for cooling air flow inlet and cable connections. Also, clearance of at least one inch is required at the top and on each side for cooling air flow.

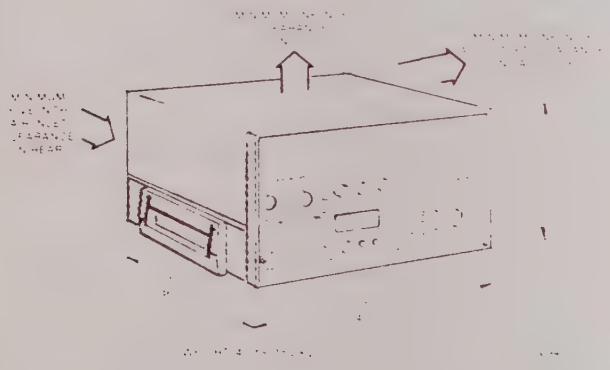


Figure 3–1. Model TTS 41-3A Outline Drawing

3.7 POWER CONNECTION

3.8 The unit operates on 105 to 120 Vac or 215 to 240 Vac, 50 to 60 Hz power. Be sure the rear panel SELECT VOLTAGE switch is properly positioned for the power source used.

CAUTION

Two-ampere slow blow fuses, required for 115-volt operation, are installed in the rear panel fuse holders at the factory. These fuses must be changed to 1-ampere slow-blow when 230-volt operation is selected.

3.9 The power cord supplied with the unit has a standard NEMA 3-prong, wall-outlet type plug at one end. The other end mates with a 3-prong connector located on the unit's rear panel. The analyzer consumes about 60 watts of power.

NOTE

Besides meeting safety standards, the NEMA ground pin on the power cord establishes a common reference between telephone office ground and the analyzer's chassis ground. Do not modify this connection as it will affect operation of the unit.

3.10 PRE-INSTALLATION CHECKOUT PROCEDURE

3.11 The following procedure is a means of generally verifying the analyzer's operational status after shipping before installation. No telephone lines should be connected to the analyzer during this procedure.

INITIAL SETTINGS

1. Set POWER switch down.
2. Release all press-to-engage switches.
3. Set all timing controls for their nominal times (12 o'clock positions).
4. Set MODE switch to IDLE.
5. Set LEAK/LOOP switches to NORM.
6. Set TT/DP/MF to TT.
7. Set DIALER PROGRAM thumbwheel switch for SPEED of 1 digit per second, and a tone-on period (% BRK digits) of 50%. (The IDT digits are not used in this procedure.)
8. Set RESET/→/NORM switch to NORM.
9. Set MASTER and DIALING VOLUME controls to midrange.
10. Insert a dummy (not wired) type 310 plug into front panel LINE CONTROL A jack.

ACTION	RESULT
1. Set POWER switch to ON.	All indicators except channel A and channel B TEST, TRACE, BUSY light. POWER INTERRUPT indicator flashes. All readouts display 8's.
2. Press RESET pushbutton for at least one second.	POWER INTERRUPT indicator stops flashing. TEST RESULTS readout becomes blank. The following indicators are lighted. a. A IDLE b. B IDLE, c TEST PROGRESS IDLE, d PROGRAM ERROR.
3. Press to engage TEST A pushbutton.	
4. Press to engage DELAY pushbutton.	
5. Press to engage ANS SUP pushbutton.	PROGRAM ERROR indicator goes out.
6. Set RESET/→/NORM switch at RESET then at load (→)	TEST PROGRESS readout becomes blank.
7. Use keyset to enter 1234567890 EON into dialer.	Digits are displayed in TEST PROGRESS readout at half brightness.
8. Set RESET/→/NORM switch at NORM	
9. Check to be sure START AFTER control is set to 4 seconds	
10. Press to engage FAULT pushbutton	

ACTION	RESULT
11. Set MODE switch to AUTO.	The analyzer places a single test call. The TEST A indicator should light. Indicators in the TEST PROGRESS section of the front panel should indicate which operation the unit is performing. After each digit is dialed, it is displayed at full brightness. Touch-tone signals can be heard from unit's speaker. (Adjust DIALING VOLUME control as necessary.) After the DIALING COMPLETED WAITING FOR TEST RESULTS period ends, the NO ANSWER and SYSTEM HELD indicators light. An alarm tone should be heard from the unit's speaker. NOTE If alarm volume is unsatisfactory refer to paragraph 3.12. The digit 1 appears in TEST RESULTS readout.
12. Press NO ANSWER pushbutton.	TEST RESULTS readout indicates 1.
13. Press NO DIAL TONE pushbutton.	TEST RESULTS readout is blank.
14. If desired, place another test call by placing MODE switch momentarily at IDLE, then return to AUTO. When satisfied with analyzer's performance, set POWER switch down.	
15. Successful completion of above steps indicates analyzer has been shipped without internal damage and is ready for installation and use.	

3.12 ALARM VOLUME ADJUSTMENT

NOTE

This adjustment is to be made only if the alarm volume is unsatisfactory.

3.13 To adjust the analyzer's alarm volume perform the following steps.

1. Set POWER switch down.

2. Remove the unit's top cover by removing a retaining screw on each side of the unit near the rear corners.

3. Place card 5 (ejector marked 5) on a suitable extender board.

4. Be sure no telephone lines connect to analyzer and perform checkout procedure of paragraph 3.10. Stop at step 11.

5. Refer to Figure 3–2 and adjust the alarm volume potentiometer until volume is satisfactory.

6. Set MODE switch to IDLE.

7. Set POWER switch to OFF.

8. Replace card 5 and analyzer top cover.

Figure 3—2. Alarm Volume Adjust Control

3.14 TELEPHONE LINE CONNECTIONS

3.15 Up to 16 wet-loop type 600 or 900 telephone lines (either T/R or T/R/S) can be connected to the unit for test call origination. Do not connect sleeve leads of the circuits under test when the analyzer is used in a #5 crossbar office. The lines connect to jack fields on the rear of the unit via standard type 310 plugs. (Figure 4—14 shows the jack field and other rear panel connection points). It is normal practice to evenly distribute lines between channel A and channel B. This allows troubleshooting on a held line on one channel while testing is in progress on the other channel.

3.16 For convenience, one or two lines can be connected to the unit via channel A and channel B jacks on the front panel. Type 310 plugs are used for these connections also. When a line is connected to either of the front panel jacks, the rear jack fields are automatically disabled.

3.17 If the analyzer's internal test line is to be used, an incoming circuit must be connected to the INCOMING CIRCUIT terminals on the barrier strip in the rear of the unit. The incoming circuit connections to the barrier strip can be: (a) T/R/S, or (b) T/R only, or (c) S only.

3.18 The internal test line contains a 1-kHz tone source. The 1-kHz tone will be coupled to the incoming circuit tip and ring leads when the test line is tripped by detection of 20 to 60-Hz ringing on the INCOMING CIRCUIT T and R terminals.

3.19 The analyzer is shipped with the internal test line strapped for proper operation when connected to incoming T R S or T/R circuits. With this normal strapping, the unit will recognize completion of calls to the internal test line by detection of 20 to 60-Hz ringing on the INCOMING CIRCUIT T/R terminals with the S terminal either: (a) open circuit, or (b) ground, or (c) any potential more positive than −7 Vdc. If a potential more negative than −15 Vdc is present on the INCOMING CIRCUIT S terminal, the analyzer will not record a call completion even if 20 to 60-Hz ringing is detected on the INCOMING CIRCUIT T/R terminals.

3.20 If it is desired to operate the analyzer with only an S lead (no T/R leads) connected to the INCOMING CIRCUIT terminals, the factory strapping must be changed. To change the strapping and implement S-lead-only call completion detection, perform the following steps.

1. Remove the unit's top cover by removing a retaining screw on each side of the unit near the rear corners.

2. Identify incoming circuit pc board 96826 located at the left rear of the unit and mounted to the rear panel.

3. Locate a jumper strap connected between terminals A and C on the incoming circuit pc board. Figure 3—3 shows the location of this strap.

4. Reposition jumper strap between terminals B and C.

5. Replace analyzer's top cover.

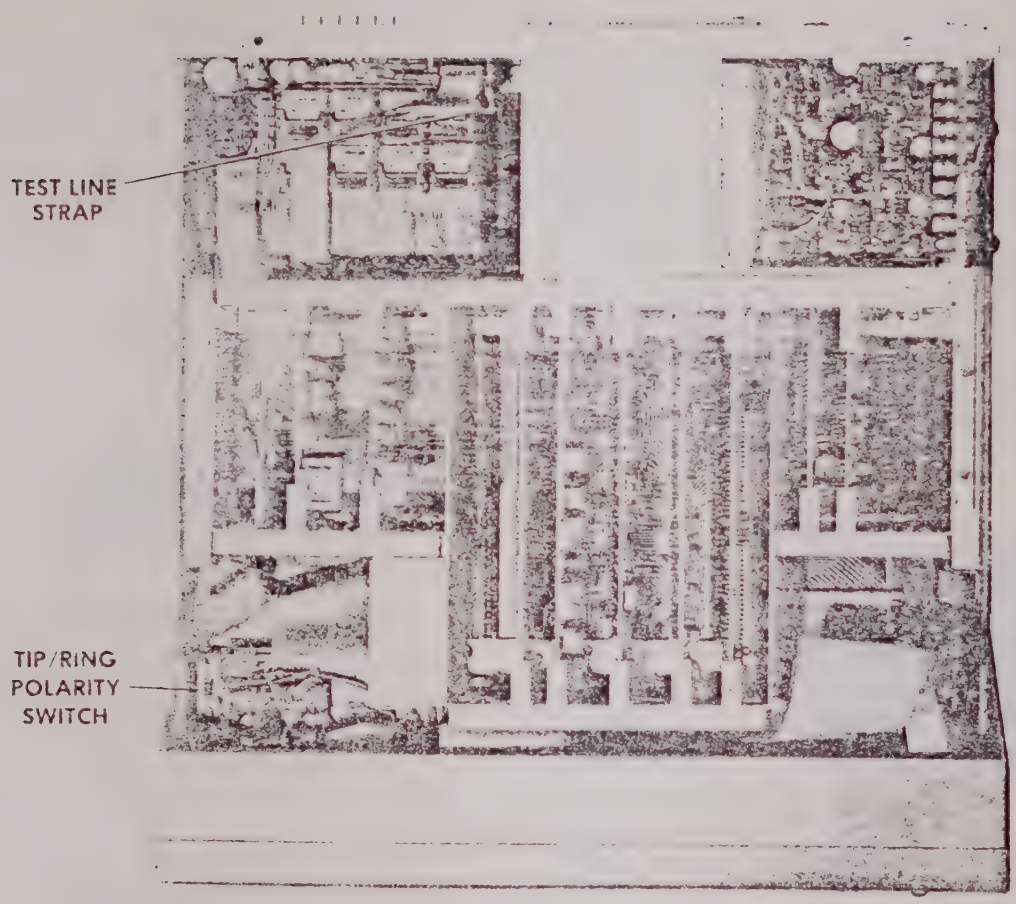


Figure 3—3. Test Line Strap And Tip/Ring Polarity Switch Location Diagram

3.21 When strapped for S-lead-only sensing, the unit will recognize completion of calls to the internal test line when the INCOMING CIRCUIT S terminal becomes either: (a) open circuit, or (b) ground, or (c) any potential more positive than −7 Vdc. When a potential more negative than −15 Vdc is present on the INCOMING CIRCUIT S terminal, the analyzer will not record a call completion.

3.22 **TIP/RING POLARITY CHECK**

3.23 After call origination lines are connected to the analyzer, a check must be made to determine if the unit is compatible with the tip/ring polarity of the call origination lines. To make this check, perform the following steps.

1. Engage the following pushbuttons:

   (1) TEST A,

   (2) TEST B,

   NOTE

   If a single call origination line connects to a front panel channel A or channel B jack, engage only the TEST pushbutton corresponding with the channel used.

   (3) DELAY,

   (4) ANS SUP.

2. Set Mode switch to IDLE.

3. Set POWER switch to ON.

4. Press RESET pushbutton for at least one second. The analyzer should select an idle call origination line at this time.

5. Observe front panel LINE CONTROL meter. If meter reads almost full scale to the left (REVERSE), analyzer is incompatible with the tip/ring polarity of the call origination lines. This condition can be corrected by changing the position of an internal switch as described in the following steps. If LINE CONTROL meter reads almost full scale to the right (NORMAL), analyzer is compatible with call origination lines and hence, no further steps are necessary. (Set POWER switch down if meter reads NORMAL, otherwise continue with procedure.)

NOTE

Some loop trunks are in the off-hook (REVERSE) state when idle. When the analyzer is used with this type of trunk, the internal tip/ring polarity switch must be set such that the front panel meter indicates REVERSE when an idle line is selected.

6. Remove the unit's top cover by removing a retaining screw on each side of the unit near the rear corners.

7. Refer to Figure 3—3 to locate the internal tip/ring polarity reversal switch at the left front of the unit.

8. Set switch to its other position. Meter should read almost full scale to the right.

9. Replace analyzer's top cover and set power switch down.

3.24 After the tip/ring polarity check as described above has been made, installation is complete and the unit is ready for normal operation.

SECTION 4

OPERATION

4.1 This section contains operating information for the TTS 41-3A Service Analyzer. General operating instructions are given first, followed by example applications. The example applications show how the analyzer can be used to perform specific routining tasks. For reference purposes, complete control and indicator tables and illustrations are provided at the end of this section.

NOTE

Proper operation of the analyzer requires that the tip/ring polarity check, given in paragraph 3.22, be made at the time of installation. If the installation instructions given in Section 3 were followed previously, this check has already been made.

4.2 GENERAL OPERATING INSTRUCTIONS

4.3 The following paragraphs contain the information needed to properly program and operate the Model TTS 41-3A Service Analyzer.

4.4 PREPARATION FOR USE

4.5 The analyzer should be connected to a source of ac power and to telephone lines as described in Section 3 of this manual. Before operating the analyzer, make the following initial control settings.

a. POWER switch down.

b. All press-to-engage switches released.

c. LEAK/LOOP switches to NORM.

d. TT/DP/MF switch to DP.

e. RESET/→/NORM switch to NORM.

f. MODE switch to IDLE.

g. SYSTEM TIMING and MON controls to 12 o'clock.

h. START DIAL COMMAND controls to 12 o'clock.

i. DB switches to 12 o'clock.

4.6 INITIAL POWER-UP AND RESET

4.7 To energize the analyzer and prepare it for programming, set POWER switch to ON and press RESET pushbutton for at least one second. (See Figure 4—1.) The RESET pushbutton must be pressed whenever the unit is powered-up and anytime there is an interruption of the unit's ac power. The following indicators should be lighted at this time:

a. A IDLE or A BUSY

b. B IDLE or B BUSY,

c. TEST PROGRESS IDLE,

d. PROGRAM ERROR

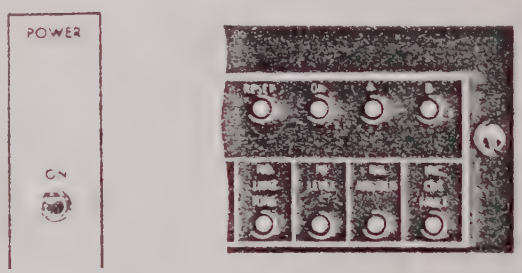


Figure 4—1. Power-Up And Reset Controls

4.8 LINE CONTROL PROGRAMMING

4.9 The line control program allows the user to place test calls on channel A and/or channel B lines as desired. Normally, both TEST pushbuttons are engaged to condition the analyzer for testing on both channel A and B lines. (See Figure 4—2.) If two-channel testing is selected, **and** all lines are idle, test calls will alternate between channel A and channel B. (Busy lines and empty rearpanel circuit selector jacks are automatically bypassed.)

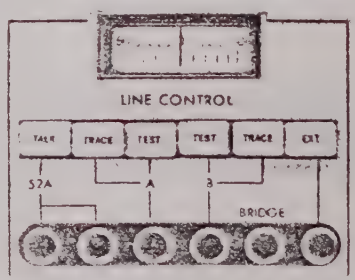


Figure 4—2. Line Controls

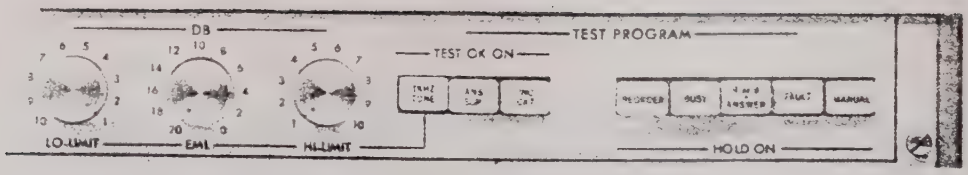


Figure 4—3. Test Program Controls

4.10 Single channel testing can be selected whenever desired by the user to obtain call completion data for one channel. If testing on channel A lines only is desired, engage only the TEST A pushbutton. Similarly, engaging only the TEST B pushbutton selects channel B only testing

NOTE

One or both TEST pushbuttons must be engaged to avoid a program error condition.

4.11 The analyzer's TRACE function is used only for troubleshooting (as described in paragraph 4.46) and hence, the TRACE pushbuttons are normally released. The TALK and EXT pushbuttons are also normally released. If an explanation of the TALK, EXT, or BRIDGE functions is desired refer to Table 4—3.

4.12 TEST PROGRAMMING

4.13 The analyzer's test program determines (a) the tests to be performed on call origination lines and (b) what conditions, if any, will cause the analyzer to halt automatic operation and hold (remain off-hook) the line under test for troubleshooting. (See Figure 4—3.)

4.14 To select the tests to be made on the lines under test, perform the following steps.

1. If detection of an open C lead fault is desired, engage the OPEN C-LEAD pushbutton.

2. If detection of false tip/ring polarity reversal during dialing is desired, engage the REV DRNG-DIAL pushbutton.

3. If detection of 1-kHz tone is desired, engage the 1KHZ TONE pushbutton. The 1-kHz tone source can be the analyzer's built-in test line or other source such as a type 102 test line. After engaging the 1KHZ TONE pushbutton, the DB controls must be set to establish acceptable upper and lower limits for the received level of 1-kHz tone. The DB controls can be set as follows.

a. Set EML control for the expected measured level (in — dBm) of detected 1-kHz tone. If the analyzer's internal test line is to be the source of 1-kHz tone, set the EML control for 0 dBm minus the estimated loss from telephone equipment

NOTE

The expected level will be as selected by the EML control for both 600 and 900-ohm circuits.

b. Set LO-LIMIT control for the allowed (as determined by the user) negative deviation (in dB) from the EML control setting.

c. Set HI-LIMIT control for the allowed positive deviation (in dB) from the EML control setting.

4. If detection of answer supervision (tip/ring polarity reversal) is desired, engage the ANS SUP pushbutton.

5. If detection of a call completed to the unit's internal test line is desired, engage the INC CKT pushbutton. For this test, the rear panel INCOMING CIRCUIT terminals must connect to an incoming circuit as described in Section 3.

4.15 Any combination (or all) of the above tests can be selected. To record a TEST OK, **all** selected tests must be satisfied (no faults detected).

NOTE

To avoid a program error condition, at least one (or more) of the following pushbuttons must be engaged: 1KHZ TONE, ANS SUP, and INC CKT.

4.16 The analyzer can be made to halt automatic operation and hold the line under test for troubleshooting when a call completion failure is encountered. To select a HOLD ON program, perform the following steps.

1. Engage the HOLD ON REORDER pushbutton if interruption of automatic testing is desired when the unit detects reorder tone without false tip/ring polarity reversal (answer)

2. Engage the HOLD ON BUSY pushbutton if interruption of automatic testing is desired when the unit detects busy tone without false tip/ring polarity reversal (answer).

3. Engage the HOLD ON R OR B ANSWER pushbutton if interruption of automatic testing is desired when the unit detects false tip/ring polarity reversal (answer) and either reorder tone or busy tone

4. Engage the HOLD ON FAULT pushbutton if interruption of automatic testing is desired when the unit detects any fault. A fault occurs when the test program is not satisfied or the unit detects a no dial tone (or no wink) fault. Busy and reorder conditions are not considered faults by the analyzer.

4.17 All, none, or any combination of the above described HOLD ON pushbuttons can be engaged. The HOLD ON MANUAL pushbutton is used only for manually holding the line under test and should initially be released.

NOTE

It is normal practice to select one or more HOLD ON conditions when the analyzer is used with the Model 4101 or 4101A Identifier.

4.18 SYSTEM TIMING PROGRAM

4.19 The analyzer's overall timing can be adjusted by the front panel SYSTEM TIMING controls to meet the requirements of the user. (See Figure 4—4.) Each of these controls are described in following paragraphs.

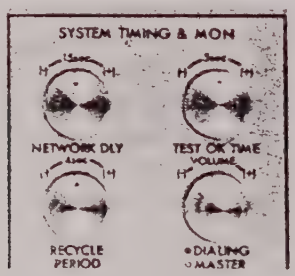


Figure 4—4. System Timing And Monitor Controls

4.20 The NETWORK DLY control sets the maximum time allowed to obtain a test OK after completion of dialing. The time can be set from approximately 2 to 60 seconds. If the test program is not satisfied and a busy or reorder tone is not detected during this time interval, a fault is recorded in the appropriate category. **A typical setting for this control is 15 seconds.**

4.21 The RECYCLE PERIOD control sets the minimum time the unit will be on-hook between test calls. The control permits adjustment from approximately 2 to 8 seconds. After this time period expires, the unit will begin the next test call if an idle line has been selected. **A typical setting for this control is 4 seconds.**

4.22 The TEST OK TIME control sets the minimum time a satisfactory test result must be present before a test OK can be recorded. This control can be set from approximately 2 to 8 seconds. **A typical setting is 5 seconds.**

4.23 The DIALING/MASTER VOLUME controls can be adjusted as desired while test calls are in progress. These controls should be initially set at midrange.

4.24 START DIAL PROGRAM

4.25 The start dial program determines the conditions that must be met before dialing can begin. Also, if the analyzer is programmed to pause one or more times during the dialing sequence (a WSD interval), the start dial program must be satisfied again before dialing can resume. (This allows proper operation with PBX's and other equipment requiring a pause in the dialing sequence.)

4.26 The possible start dial programs are of two general types: DELAY and DIAL TONE. A third, special start dial program is provided primarily for use with the Northeast Electronics Model 4101 or 4101A Identifier. Figure 4—5 shows the start dial controls.

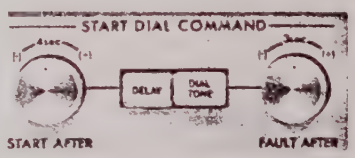


Figure 4—5. Start Dial Command Controls

4.27 Engaging the DELAY pushbutton conditions the analyzer to begin dialing after a preset time interval expires following initial off-hook. When a programmed WSD pause is encountered during the dialing, the same start-dial delay must expire before dialing can resume. The START AFTER control sets the start-dial delay from approximately 2 to 8 seconds. **A typical setting is 4 seconds.**

4.28 Engaging the DIAL TONE pushbutton conditions the analyzer to begin (or resume) dialing upon receipt of dial tone. The FAULT AFTER control setting determines the maximum time the unit will wait for dial tone.

If dial tone is not detected during the fault-after period, the test call is aborted, a no dial tone fault is recorded, and the NO DIAL TONE indicator lights. The FAULT AFTER control can be varied from approximately 1 to 7 seconds. **A typical setting is 3 seconds.**

4.29 On analyzer's equipped with multifrequency dialing, the function of the DIAL TONE pushbutton is expanded to include wink and similar start dial signals. Hence, dialing begins (or resumes) when either dial tone or wink is received. Specifically, either of the following is considered a valid start dial signal:

1. Dial tone.

2. A reversed tip and ring polarity (off-hook) present on the line under test for at least 128 milliseconds followed by a return to normal polarity (on-hook) that lasts for at least 128 milliseconds. The line under test can be in either the normal or reversed condition prior to seizure.

4.30 If an expected wink or similar start dial signal is not received during the fault-after delay period, the analyzer responds as described above for a no dial tone condition. Hence, the no dial tone fault category can contain no wink as well as no dial tone faults.

4.31 A special start dial program, provided primarily for use with the Model 4101 or 4101A Identifier, can be obtained by engaging both the DELAY and DIAL TONE pushbuttons. This program conditions the unit to: (a) begin dialing when dial tone (or wink) is received after initial off-hook, and if WSD commands are entered into the dialer, to (b) resume dialing after the START AFTER delay expires. (Detecting neither dial tone nor wink within the FAULT AFTER period after off-hook produces a no dial tone fault as described above.) This start dial program, in conjunction with the dialer program, ensures that the Identifier has sufficient time to transmit its recognition signal and should be selected under the following conditions:

1. The analyzer is used with the Model 4101 or 4101A Identifier, and

2. It is desired to check for the presence of dial tone or wink, and

3. Dialing is to be either Touch-Tone or multifrequency.

NOTE

At least one of the START DIAL COMMAND pushbuttons must be engaged to avoid a program error condition. Also, if the previous instruction has been followed correctly, a PROGRAM ERROR message should not be displayed at this time.

4.32 PROGRAMMING THE DIALER

4.33 The analyzer's dialer program defines: (a) the number that wil be dialed, (b) the type of dialing (dial pulse, Touch-Tone, or multifrequency), and (c) certain dialing parameters. Figure 4—6 shows the dialer controls.

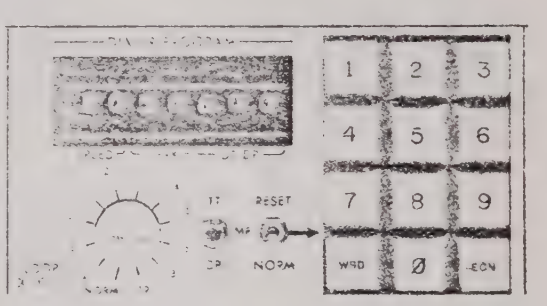


Figure 4—6. Dialer Controls

4.34 The number to be dialed should be the number necessary to reach a type 102 or other suitable test line. If the analyzer's built-in test line is to be used, the dialing number is the number for the incoming circuit connected to the analyzer's rear panel INCOMING CIRCUIT terminals. To enter the dialing number, place RESET/→/NORM switch to RESET then place to → (load). The number to be dialed can now be entered with the keyset.

4.35 If one or more wait-for start-dial intervals (DIAL TONE or DELAY) are required between the digits of the dialing number, press the WSD key at the points in the dialing number where the waits should occur. For example, if the analyzer is to dial through PBX-type equipment to reach a central office, the WSD key is pressed after entering the digit necessary to obtain the second dial tone (usually the digit 9). Then the remainder of the number to be dialed can be entered.

4.36 If the analyzer is to be used with the Northeast Electronics Model 4101 or 4101A Identifier, **and** if it is determined that the special start dial program described in paragraph 4.31 is necessary, a WSD must be entered between the first and second digits of the dialing number. This conditions the analyzer to pause after dialing the first digit, thereby allowing the Identifier sufficient time to transmit its recognition signal.

4.37 After all digits of the number to be dialed are entered, press the EON (end of number) key and return

the RESET/→/NORM switch to NORM. The dialing digits should be displayed in the TEST PROGRESS readout at half brightness. (After each digit is dialed, it will be diplayed at full brightness.) The EON character and any WSD characters programmed are not displayed.

NOTE

The unit's dialer has a maximum capacity of 15 digits plus 1 EON character. However, each WSD character entered reduces the unit's numerical digit capacity by one. Also, only the first 11 numerical digits are displayed.

4.38 Either Touch-Tone, dial puise or multifrequency dialing can be selected by setting the TT/DP/MF switch to the appropriate position. If this switch is set to MF on unit's not equipped with the multifrequency option, a program error condition will result.

NOTE

When a Model TTS 41-3A (equipped with the multifrequency option) is programmed to send MF signaling, the KP and ST tones will be transmitted automatically at the proper times.

4.39 The DIALER PROGRAM thumbwheel switch can be set as indicated in the following steps.

1. Set the SPEED thumbwheels of the DIALER PROGRAM switch for 1 to 99 pulses per second as desired if dial pulsing. **A typical setting is 12 pulses per second.** For Touch-Tone or multifrequency dialing, set the SPEED thumbwheels for 1 to 99 digits per second as desired. **A typical setting is 10 digits per second.**

2. Set the % BREAK thumbwheel of the DIALER PROGRAM switch for 1 to 99 percent break as desired if dial pulsing. **A typical setting is 60 percent break.** For Touch-Tone or multifrequency dialing, set the % BREAK thumbwheels for a duty cycle (tone on period) of 1 to 99 percent as desired. **A typical setting is 50 percent tone.**

3. Set the IDT thumbwheels of the DIALER PROGRAM switch for an interdigital time of 1 to 999 milliseconds as desired only if dial pulsing. **A typical setting is 600 milliseconds.** For Touch-Tone or multifrequency dialing, the IDT thumbwheels have no effect.

4.40 If dialing is to be DP, one of several values of leak impedance or loop resistance can be selected with the LEAK/LOOP switches. Leak impedance is a standardized impedance network shunted across the line under test during dial pulsing to simulate the effects of ringing bridges, senders, etc. Table 4—1 lists leak impedances that can be selected with the LEAK switch (inner knob), and gives application information for each network. If leak impedance is not desired, set the LEAK switch to NORM.

NOTE

Four resistive leak impedances are included in the unit. These are primarily used in routining Stromberg-Carlson X-Y offices.

Table 4—1. TTS 41-3A Leak Impedance Networks

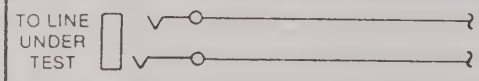
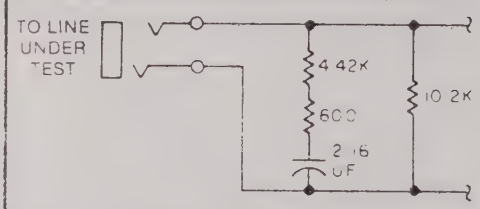
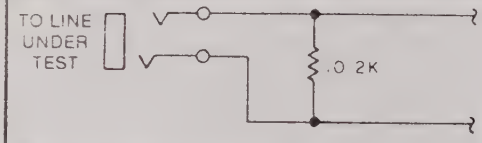
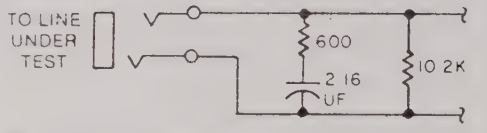
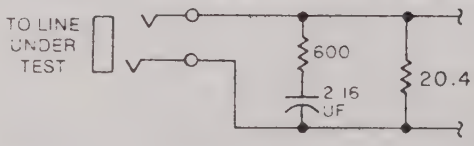
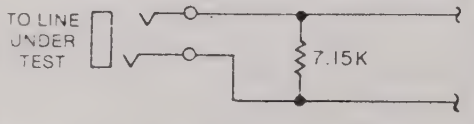
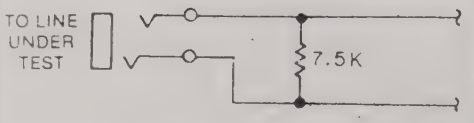
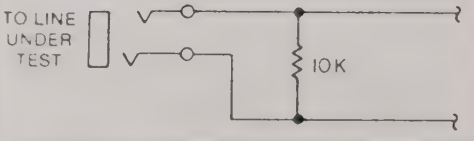
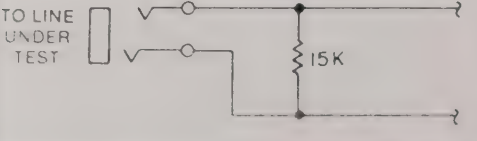
LEAK SWITCH SETTING	SCHEMATIC	SIMULATES	
NORM		Open circuit	
A		A subscriber line near the central office equipped with five C4A ringing bridge extensions and a 15K-ohm leak on the drop wire	
B		A sender output without contact protection and with a 10.2-kohm leak.	
C		A circuit sender loop pulsing network with a 10.2- k ohm leak across the trunk.	
D		A sender output with a leak of 20.4 k ohms	
7.15		A line with a 7.15-k ohm leak	For Stromberg-Carlson X-Y Offices
7.5		A line with a 7.5-k ohm leak	
10		A line with a 10-k ohm leak.	
15		A line with a 15-k ohm leak	

Table 4—2. TTS 41-3A Loop Resistance Values

LOOP SWITCH POSITION	VALUE
N	< 1 ohm
6	600 ohms
8	800 ohms
10	1 kohms
11	1.1 kohms
12	1.2 kohms
13	1.3 kohms
14	1.4 kohms
15	1.5 kohms
16	1.6 kohms
18	1.8 kohms
19	1.9 kohms

4.41 Loop resistance is a resistance placed in series with the line under test during dial pulsing to simulate the effects of various loop lengths. Table 4—2 lists the loop resistance values that can be selected with the LOOP switch (outer knob). If loop resistance is not desired, set LOOP switch to NORM.

NOTE

It is not typical practice to use both leak impedance and loop resistance at the same time.

4.42 TESTING INSTRUCTIONS

4.43 After the analyzer is correctly programmed as described in the previous paragraphs, it can be applied to the desired routining task. The following is a logical procedure to begin testing operations

ACTION	RESULT
1. To verify installation and programming of the analyzer, place MODE switch to SINGLE CALL.	Unit goes off-hook on the selected idle channel A or channel B line. If the start dial program is satisfied, the unit dials the stored number. The dialing signals (DP, TT, or MF) are heard as the number is dialed. The dialed digits appear in TEST PROGRESS readout at full brightness. Indicators in the TEST PROGRESS display show which operation the unit is currently performing. If the test program is satisfied, the TEST OK indicator lights and a count is placed in the test OK category. If a test selected by one of the engaged test program pushbuttons is not satisfied, a fault is recorded in the appropriate test results category, and the appropriate test results indicator lights. If the unit detects busy or reorder tone, a count is placed in the appropriate test results category and the appropriate indicator lights. The unit also determines if false tip/ring polarity reversal (answer) occurs with a busy or reorder tone. After the unit determines test results, it remains off-hook and the SYSTEM HELD indicator lights. An alarm tone is heard from the unit's speaker.
2. If analyzer did not perform as expected, set MODE switch to IDLE and recheck installation and programming. Repeat step 1 until proper operation is achieved.	

ACTION	RESULT
3. Adjust DIALING/MASTER VOLUME controls as desired. (The DIALING VOLUME control sets the volume only when unit is dialing.)	
4. Set MODE switch to AUTO	Analyzer places a test call as described in step 1. After test results have been determined, the unit returns on-hook unless held off-hook by a HOLD ON program. NOTE If troubleshooting on a held line is desired, refer to paragraph 4.46. All test result indications are removed when the unit returns on-hook. The unit remains on-hook for a time determined by the RECYCLE PERIOD control. Then the unit goes off-hook to place another test call if another idle line has been found.
5. To remove unit from a SYSTEM HELD condition, momentarily place MODE switch to IDLE, then return to AUTO.	Unit resumes testing.
6. If manually holding the line under test is desired, engage the MANUAL pushbutton	SYSTEM HELD indicator lights. Unit remains off-hook at the end of the current test cycle.
7. Release MANUAL pushbutton to resume automatic testing if this pushbutton was engaged previously.	Unit resumes testing.
8. Release the line under test and halt all testing at any time by setting MODE switch to IDLE	IDLE indicator lights. Testing stops.

4.44 READING OUT TEST RESULTS

4.45 The TEST RESULTS readout normally displays the total number of tests performed. The counts stored for all other test result categories are displayed in the TEST RESULTS readout when the corresponding pushbuttons are pressed. (See Figure 4-7.) To reset all test result categories to zero (blank), press RESET pushbutton with MODE switch at IDLE.

Figure 4—7. Test Results Controls And Indicators

4.46 TROUBLESHOOTING A CALL COMPLETION FAILURE

4.47 If the analyzer detects a call completion failure for which a HOLD ON pushbutton is engaged, the analyzer will halt automatic operation and hold (remain off-hook) the failed line for troubleshooting. An alarm tone will be heard at this time and the SYSTEM HELD message will be displayed. If an open C-lead condition occurs on the failed line, the analyzer automatically supplies up to approximately 180 mA sleeve current in an attempt to hold switched connections for troubleshooting.

4.48 When the unit is holding a failed line, all digits of the dialing number will be displayed at full bright intensity only if the entire number was succesfully dialed. If a fault occurred during the dialing period, only those digits successfully dialed will be displayed at full bright

ness. Thus, a call completion failure detected during dialing can be pinpointed to a particular switching level by noting the relationship of half-bright to fully-bright digits on the TEST PROGRESS readout.

4.49 The analyzer will hold a failed line for troubleshooting as long as necessary. A held line can be released and testing resumed at any time by setting the MODE switch momentarily at IDLE then returning to AUTO.

4.50 The unit's trace feature can be used to aid in troubleshooting a call completion failure. For example, when a failure is encountered on channel A and the analyzer is holding the line, engaging the TRACE A pushbutton switches onto the failed line: (a) a distinctive tracing tone, and (b) a special holding circuit. This allows the unit's primary holding circuit to be used for testing on channel B while troubleshooting progresses on channel A. To resume testing on channel B (TEST B pushbutton must be engaged) while tracing and troubleshooting is in progress on channel A, momentarily set the MODE switch to IDLE then return to AUTO. It is not necessary to release the TEST A pushbutton.

4.51 Similarly, the engaged TRACE B pushbutton couples a tracing tone to a held channel B line and allows simultaneous troubleshooting on channel B while testing on channel A. The unit's tracing tone can be coupled to a held line as long as necessary. Normal, two-channel testing can resume only after both TRACE pushbuttons are released.

4.52 OVER RANGE INDICATION

4.53 Each test result category has a count capacity of 9999. The TOTAL TESTS category reaches this count first, and when this occurs, the OVER RANGE indicator lights. After any category goes over range, the count then continues in that category moving up again from zero. To remove the OVER RANGE indication, press the RESET pushbutton with MODE switch at IDLE. This action also resets all test result categories to zero.

4.54 POWER INTERRUPT INDICATION

4.55 This indicator flashes to indicate unit's power has been momentarily removed. The off (down) to ON transition of the POWER switch also causes this indicator to flash. When the power interrupt indication occurs, the PROGRAM ERROR indicator lights and the unit is held on-hook. To remove the power interrupt indication press RESET pushbutton for at least one second with MODE switch in IDLE position. The dialing number must be reprogrammed after a power interrupt occurs.

4.56 PROGRAM ERROR INDICATION

4.57 This message indicates that the analyzer is incorrectly programmed and hence, cannot operate. The unit is forced on-hook until all program errors are corrected. Possible program errors include the following.

1. The MODE switch is not at IDLE when RESET/→/NORM switch is set to RESET or →load.

2. Both the DELAY and DIAL TONE pushbuttons are released.

3. The ANS SUP, 1KHZ TONE, and INC CKT pushbuttons are all released.

4. Both the TEST A and TEST B pushbuttons are released.

5. The TT/DP/MF switch is set to MF on a unit not equipped with the multifrequency option.

6. A power interrupt condition exists.

4.58 EXAMPLE APPLICATIONS

4.59 The following paragraphs describe several example applications for the TTS 41-3A Service Analyzer. These applications show how the analyzer interconnects with telephone equipment to perform basic routining tasks. Although the actual analyzer program used for any application is determined by the user's requirements and the telephone equipment involved, typical programs for each application are described below.

4.60 ROUTINING A SXS CENTRAL OFFICE

4.61 The TTS 41-3A can routine a SXS central office with up to 1600 lines without changing the installation. Figure 4—8 shows the analyzer properly connected to telephone switching equipment to perform this task. As shown by Figure 4—8, test calls are placed to the analyzer's built-in test line so regular office test lines can be used for other purposes.

4.62 If the central office has less than 16 line finder groups, the lines under test should be evenly divided between channel A and channel B. This allows troubleshooting a held line on one channel, while testing is in progress on the other channel.

4.63 To routine a SXS central office, the analyzer can be programmed as described in the following steps.

1. Prepare the unit for use and make initial control settings as described in paragraph 4.4.

2. Set DB controls for an EML (expected measured level) of 0 dBm and low and high limits of 5 dB.

3. Set the DIALER PROGRAM thumbwheel switch for a dialing speed of 12 pps, percent break of 60%, and an IDT (interdigital time) of 600 milliseconds.

4. Set POWER switch to ON.

5. Press RESET pushbutton located in TEST RESULTS section of front panel for at least one second.

6. Engage the following pushbuttons:

a. TEST A
b. TEST B
c. DIAL TONE,
d. OPEN C-LEAD,
e. 1KHZ TONE,
f. INC CKT.
g. FAULT.

7. Set RESET/→/NORM switch to RESET, then to load (→).

8. Enter the number necessary to reach the analyzer's test line with the keyset. After the number to be dialed has been entered press the EON key.

9. Set RESET/→/NORM switch to NORM.

4.64 The program described in the previous paragraphs conditions the analyzer to do the following.

1. Alternate test calls between channel A and channel B.

2. Begin dialing after dial tone is detected.

3. Check for open circuit or battery on the sleeve lead of the line under test after dialing begins.

4. Determine if the analyzer's internal test line has been reached. When the internal test line is reached, 1-kHz tone from the test line is sent through the office switching equipment to the analyzer channel A or channel B line on which the test call was placed.

5. Check for the presence of 1-kHz tone on the channel A or channel B line under test at a level of 0 dBm ±5 dB. The expected level selected is 0 dBm for both 600 and 900-ohm circuits.

6. Halt all testing and remain off-hook on the line under test if the analyzer detects any of the faults described in the following paragraph.

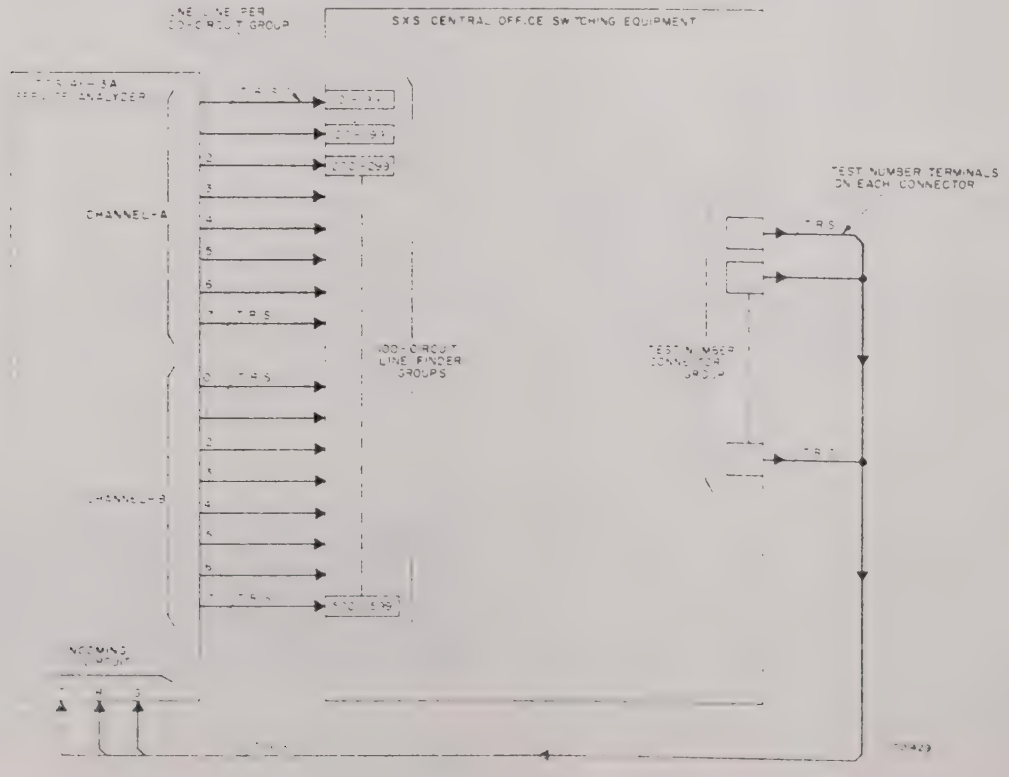


Figure 4—8. Routing A 1600-Line SXS Office

4.65 The program described previously conditions the analyzer to detect a fault if any of the following occur.

1. Dial tone is not detected within approximately 3 seconds (FAULT AFTER delay) after going off-hook.

2. The sleeve lead of the line under test is open circuit or more negative than −11V, after dialing begins. The analyzer automatically supplies up to 180 mA sleeve current in an attempt to hold switched connections for troubleshooting.

3. The [illegible] test line is not returned to [illegible] seconds (NEAR CRx delay) after dialing is completed. Refer to paragraph 3.13 for [illegible] necessary for call completion to the test line.

4. A 1-kHz tone is not present on the line under test at a level of 0 dBm ± 5 dB within approximately 15 seconds after dialing is completed.

4.66 To verify installation and programming, place a single test call by placing the MODE switch to SINGLE CALL. Adjust DIALING/MASTER VOLUME control as desired. If the analyzer did not perform as expected, return the MODE switch to IDLE and recheck installation and programming. After proper operation has been achieved, place MODE switch to AUTO to commence automatic testing.

4.67 If the analyzer detects a fault, an alarm will be heard and a lit message lamp shows the type of fault that occurred. The analyzer remains off-hook on the line under test and all testing stops. When this occurs, pressing the appropriate TRACE pushbutton will apply a tracing tone on the line under test for troubleshooting purposes. While troubleshooting with the trace tone on one channel, testing may be resumed on the other channel by momentarily placing the MODE switch to IDLE, then returning to AUTO.

4.68 As each test call is placed, the TEST RESULTS readout increments to indicate the total number of all calls attempted. The counts stored for other test result categories are displayed in the TEST RESULTS readout when the appropriate pushbuttons are pressed. Refer to Table 4−3 for a description of each test result category.

4.69 To release the line under test and halt all testing at any time, set the MODE switch to IDLE.

4.70 ROUTINING OUTGOING TRUNKS

4.71 This application describes routining outgoing loop trunks requiring dial pulse dialing, an operation that can be performed by any Model TTS 41-3A. Where multifrequency dialing is required, the analyzer must be equipped with the multifrequency option. (An application involving the multifrequency option is given later in this section.) The Model TTS 41-3A cannot be used on 4-wire trunks.

4.72 The analyzer can be connected to outgoing trunks as shown in Figure 4−9. If less than 16 trunks are to be tested, they should be evenly divided between channel A and channel B. This allows troubleshooting a held line on one channel, while testing progresses on the other channel.

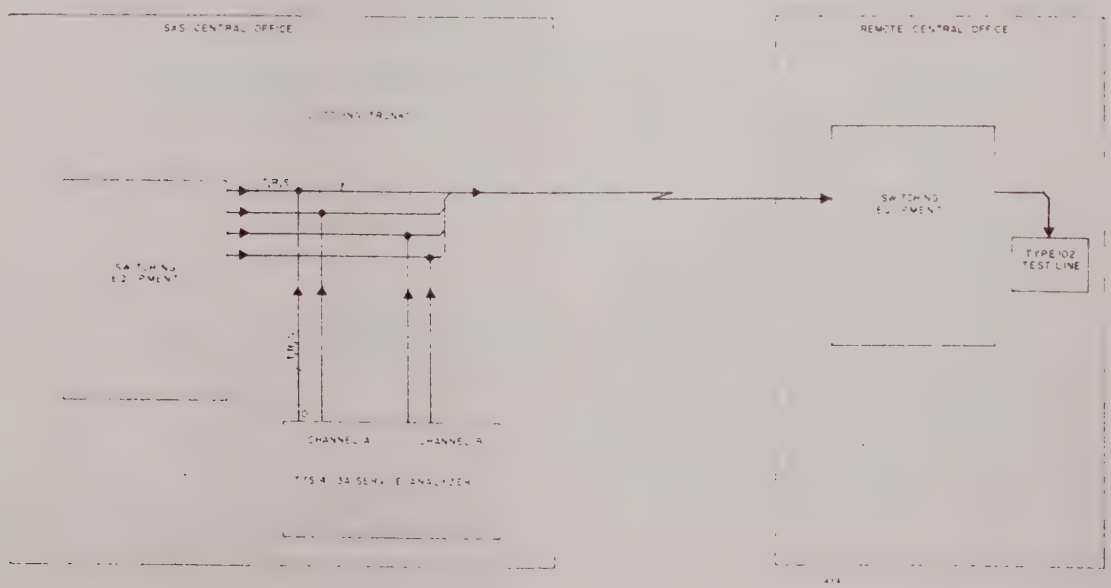


Figure 4−9. Routining Outgoing Trunks

4.73 To routine outgoing trunks, the analyzer can be programmed as described in the following steps.

1. Prepare the unit for use and make initial control settings as described in paragraph 4.4.

2. Set the DB controls for an EML (expected measured level) of 0 dBm minus the estimated loss in the outgoing trunks, and low and high limits of 5 dB.

3. Set the DIALER PROGRAM thumbwheel switch for a dialing speed of 12 pps, percent break of 60%, and IDT (interdigital timer) of 600 milliseconds.

4. Set POWER switch to ON.

5. Press RESET pushbutton located in TEST RESULTS section of the front panel.

6. Engage the following pushbuttons:

   a. TEST A,
   b. TEST B,
   c. DELAY,
   d. ANS SUP,
   e. 1KHZ TONE.

7. Set RESET/→ NORM switch to RESET, then to load →.

8. Use the keyset to enter the number necessary to reach a source of 1-kHz tone (such as a type 102 test line) located at the far end of outgoing trunks. After the number to be dialed has been entered press the ON key.

9. Set RESET/→ NORM switch to NORM.

4.74 The program described in the previous paragraph conditions the analyzer to do the following:

1. Alternately check channel A and channel B for trunks that are idle (sleeve lead open circuit or more negative than −11V). The analyzer goes off-hook when an idle trunk is selected.

2. Starts dialing approximately 4 seconds (START ANSWER lamp lit) after going off-hook.

3. Check for the presence of 1-kHz tone on the trunk under test at a level within the range determined by settings of the DB controls. The expected level is as selected on the EML control for both 600 and 900 ohm [illegible].

4. Check for presence of answer supervision (tip/ring reversal) after dialing is completed.

5. Continue testing after the analyzer detects a fault.

4.75 The program described previously for routining outgoing trunks conditions the analyzer to detect a fault if either of the following occur:

1. A 1-kHz tone is not present on the trunk under test within approximately 15 seconds (NETWORK delay) after dialing is completed. The 1-kHz tone must also be detected at a level that is within the range determined by DB control settings to avoid a fault.

2. Answer supervision is not detected within approximately 15 seconds after dialing is completed.

4.76 To verify installation and programming, place a single test call by placing the MODE switch to SINGLE CALL. Adjust DIALING/MASTER VOLUME control as desired. If the analyzer did not perform as expected, return the MODE switch to IDLE and recheck installation and programming. After proper operation has been achieved, place MODE switch to AUTO to commence automatic testing.

4.77 As each test call is placed, the TEST RESULTS readout increments to indicate the total of all calls attempted. The counts stored for other test result categories are displayed in the TEST RESULTS readout when the appropriate pushbuttons are pressed. Refer to Table 4 – 3 for a description of each test result category.

4.78 To release the line under test and halt all testing at any time, set MODE switch to IDLE.

4.79 USING THE MULTIFREQUENCY OPTION TO ROUTINE INCOMING TRUNKS

4.80 This application describes routining incoming dial trunks requiring multifrequency dialing. Figure 4 – 10 shows the analyzer properly connected to incoming trunks. If less than 16 trunks are to be tested, they should be evenly divided between channel A and channel B. This allows troubleshooting a held line on one channel, while testing progresses on the other channel.

NOTE

Analyzers without the multifrequency option are limited to operation on trunks requiring dial pulsing.

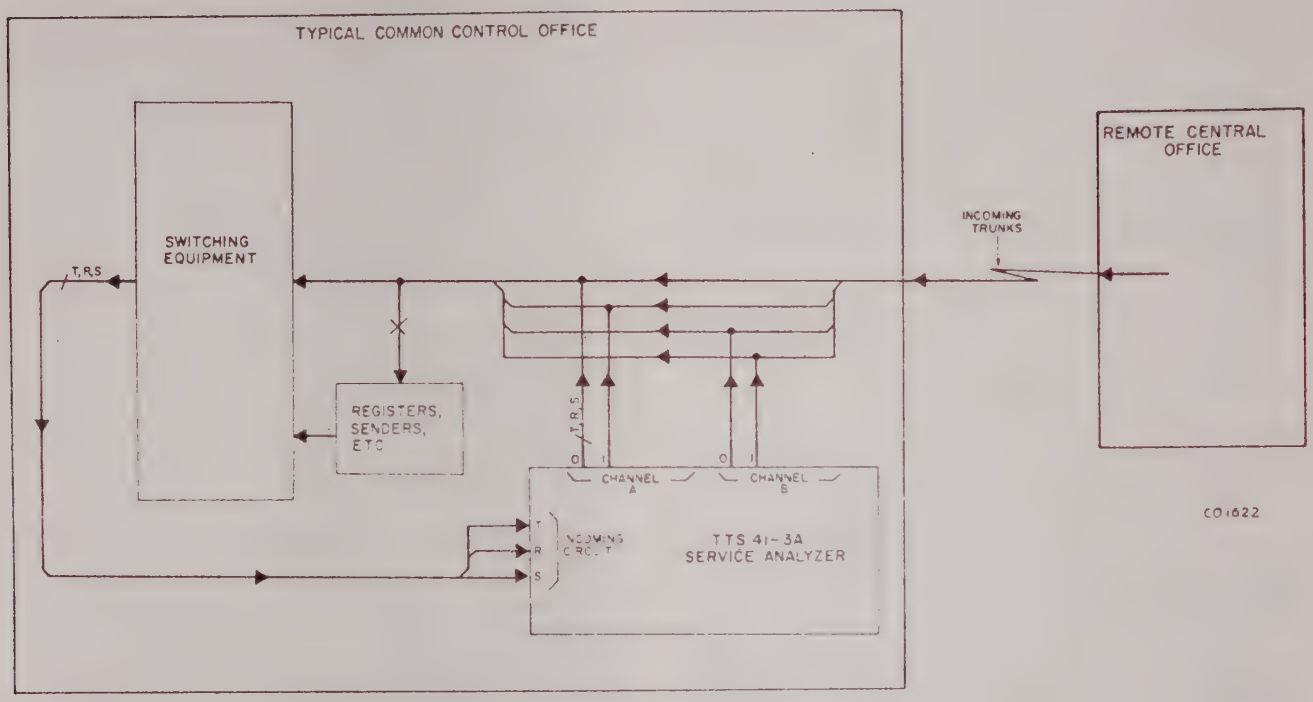


Figure 4—10. Routining Incoming Trunks

4.81 To routine incoming trunks, the analyzer can be programmed as described in the following steps.

1. Prepare the unit for use and make initial control settings as described in paragraph 4.4.

2. Set DB controls for an EML (expected measured level) of 0 dBm and low and high limits of 5 dB.

3. Set the DIALER PROGRAM thumbwheel switch for a dialing speed of 10 digits per second, and a percent tone (% BRK digits) of 50%. The IDT thumbwheels are not used in this application.

4. Set TT/DP/MF switch to MF.

5. Set POWER switch to ON.

6. Press RESET pushbutton located in TEST RESULTS section of front panel for at least one second.

7. Engage the following pushbuttons:

   a. TEST A,
   b. TEST B,
   c. DIAL TONE (programs detection of wink),
   d. ANS SUP,
   e. 1KHZ TONE,
   f. INC CKT,
   g. FAULT.

8. Set RESET/→/NORM switch to RESET, then to load (→).

9. Use analyzer's keyset to enter the number necessary to reach the analyzer's test line. After the number to be dialed has been entered, press the EON key.

10. Set RESET/→/NORM switch to NORM.

4.82 The program described in the previous paragraph conditions the analyzer to do the following.

1. Alternately check channel A and channel B for trunks that are idle (sleeve lead open circuit or more negative than −11V.) The analyzer goes off-hook when an idle trunk is selected.

2. Begin multifrequency dialing after a wink or similar start dial signal (off-hook to on-hook tip/ring reversal) is detected.

3. Transmit the KP and ST signals at the proper times.

4. Check for presence of answer supervision (tip/ring reversal) after dialing is completed.

5. Determine if the analyzer's internal test line has been reached. When the internal test line is reached, 1-kHz tone from the test line is sent through the office switching equipment to the analyzer channel A or channel B line on which the test call was placed.

6. Check for the presence of 1-kHz tone on the trunk under test at a level of 0 dBm ±5 dB. The expected level selected is 0 dBm for both 600 and 900-ohm circuits.

7. Halt all testing and remain off-hook on the trunk under test if the analyzer detects any of the faults described in the following paragraph.

4.83 The program described previously conditions the analyzer to detect a fault if any of the following occur.

1. A wink or similar start dial signal is not detected within approximately 3 seconds (FAULT•AFTER delay) after going off-hook.

2. Answer supervision is not detected within approximately 15 seconds (NETWORK delay) after dialing is completed.

3. The internal test line is not reached within approximately 15 seconds after dialing is completed. Refer to paragraph 3.19 for conditions necessary for call completion to the test line.

4. A 1-kHz tone is not present on the trunk under test at a level of 0 dBm ± 5 dB within approximately 15 seconds after dialing is completed.

4.84 To verify installation and programming, place a single test call by placing the MODE switch to SINGLE CALL. Adjust DIALING/MASTER VOLUME control as desired. If the analyzer did not perform as expected, return the MODE switch to IDLE and recheck installation and programming. After proper operation has been achieved, place MODE switch to AUTO to commence automatic testing.

4.85 If the analyzer detects a fault, an alarm will be heard and a lit message lamp shows the type of fault that occurred. The analyzer remains off-hook on the line under test and all testing stops. When this occurs, pressing the appropriate TRACE pushbutton will apply a tracing tone on the line under test for troubleshooting purposes. While troubleshooting with the trace tone on one channel, testing may be resumed on the other channel by momentarily placing the MODE switch to IDLE, then returning to AUTO.

4.86 As each test call is placed, the TEST RESULTS readout increments to indicate the total number of all calls attempted. The counts stored for other test result categories are displayed in the TEST RESULTS readout when the appropriate pushbuttons are pressed. Refer to Table 4—3 for a description of each test result category.

4.87 To release the line under test and halt all testing at any time, set MODE switch to IDLE.

4.88 ROUTINING PBX TRUNKS

4.89 The TTS 41-3A can routing PBX trunks via the switching equipment in a private branch exchange. Figure 4—11 shows the analyzer properly connected to PBX equipment to perform this task. The PBX in this example is assumed to be a SXS-type or similar type requiring dial pulsing.

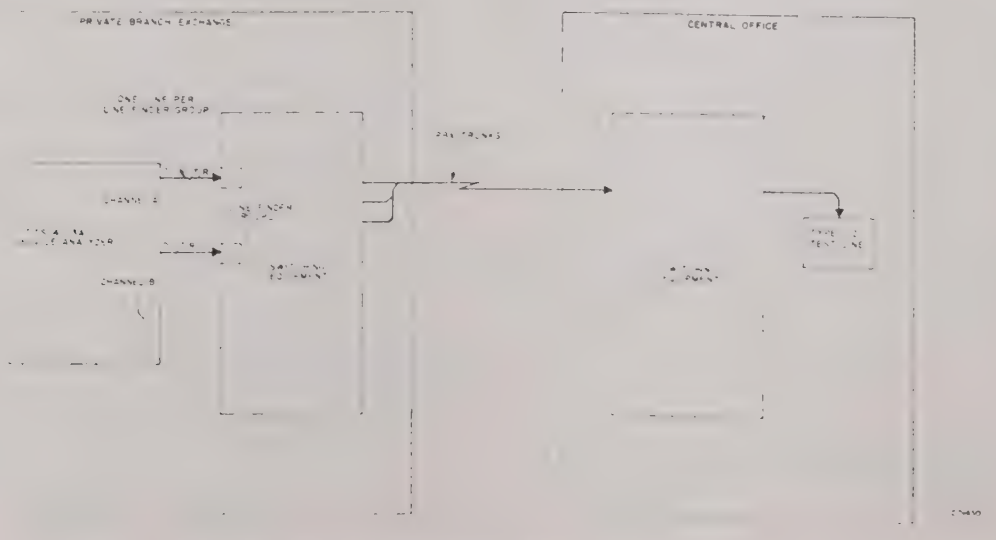


Figure 4—11. Routining PBX Trunks

4.90 If the PBX has less than 16 line finder groups, the lines under test should be evenly divided between channel A and channel B. This allows troubleshooting on a held line on one channel while testing is in progress on the other channel.

4.91 To routine PBX trunks, the analyzer can be programmed as described in the following steps.

1. Prepare the unit for use and make initial control settings as described in paragraph 4.4.

2. Set DB controls for an EML (expected measured level) of 0 dBm minus the estimated loss in the PBX trunks under test, and low and high limits of 5 dB.

3. Set the DIALER PROGRAM thumbwheel switch for a dialing speed of 12 pps, percent break of 60%, and an IDT (interdigital time) of 600 milliseconds.

4. Set POWER switch to ON.

5. Press RESET pushbutton located in TEST RESULTS section of front panel for at least one second.

6. Engage the following pushbuttons:

   a. TEST A,
   b. TEST B,
   c. DIAL TONE,
   d. REV DRNG-DIAL,
   e. 1KHZ TONE.

7. Set RESET/→/NORM switch to RESET, then to load (→).

8. Use the keyset to enter the digit required by the PBX switching equipment to obtain the second dial tone (usually the digit 9). Press the WSD key, then enter the number necessary to reach a source of 1-kHz tone (such as a type 102 test line) located in the serving central office. After the number to be dialed has been entered press the EON key.

9. Set RESET/→/NORM switch to NORM.

4.92 The program described in the previous paragraph conditions the analyzer to do the following.

1. Alternate test calls between channel A and channel B.

2. Dial the first digit after dial tone is detected, then wait for an additional dial tone before resuming the dialing.

3. Check for a false tip/ring polarity reversal during the dialing process. This condition discloses reversed wipers in SXS switch trains.

4. Check for the presence of 1-kHz tone on the PBX trunk under test at a level within the range determined by the settings of the DB controls. The expected level is as selected by the EML control for both 600 and 900-ohm circuits.

5. Continue testing after the analyzer detects a fault.

4.93 The program described previously for routining PBX trunks conditions the analyzer to detect a fault if any of the following occur.

1. Dial tone is not detected within approximately 3 seconds (FAULT AFTER delay) after going off-hook or within approximately 3 seconds after the first digit is dialed.

2. A false tip/ring reversal is detected during dialing.

3. A 1-kHz tone is not present on the PBX trunk under test within approximately 15 seconds (NETWORK delay) after dialing is completed. The 1-kHz tone must also be detected at a level that is within the range determined by DB control settings to avoid a fault.

4.94 To verify installation and programming, place a single test call by placing the MODE switch to SINGLE CALL. Adjust DIALING/MASTER VOLUME control as desired. If the analyzer did not perform as expected, return the MODE switch to IDLE and recheck installation and programming. After proper operation has been achieved, place MODE switch to AUTO to commence automatic testing.

4.95 As each test call is placed, the TEST RESULTS readout increments to indicate the total of all calls attempted. The counts stored for other test result categories are displayed in the TEST RESULTS readout when the appropriate pushbuttons are pressed. Refer to Table 4—3 for a description of each test result category.

4.96 To release the line under test and halt all testing at any time, set MODE switch to IDLE.

4.97 ROUTINING AND IDENTIFYING ORIGINATING REGISTERS IN A #5 X-BAR OFFICE

4.98 The Model 41-3A, in conjunction with the Northeast Electronics Model 4101A Identifier, can routine originating registers in a number 5 crossbar office and identify which originating register was used for each test call. To perform these operations, the Model 41-3A and 4101A should be installed as shown in Figure 4—12.

4.99 The analyzer's call origination lines should **not** include a sleeve lead. If less than 16 call origination lines are used, evenly distribute the lines between channel A and channel B. This allows troubleshooting a held line on one channel, while testing progresses on the other channel. Connect input power and sense lines to the Model 4101A Identifier as described in the Identifier's instruction manual

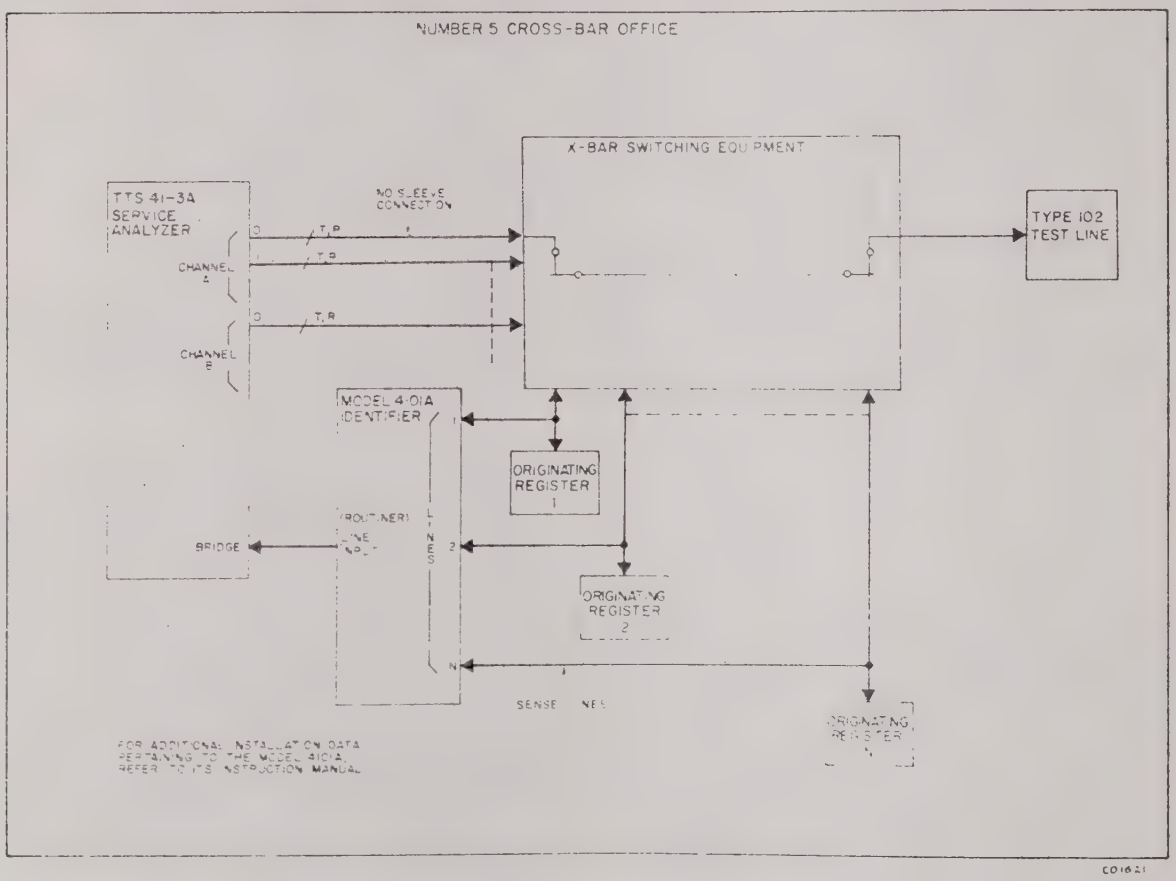


Figure 4—12. Routining And Identifying Originating Registers In A #5 X-Bar Office

4.100 The originating registers considered in this application are assumed to incorporate Touch-Tone receivers/translators. That is, Touch-Tone dialing is required for the routining operation.

4.101 To routine originating registers, the analyzer can be programmed as described in the following steps.

1. Prepare the unit for use and make initial control settings as described in paragraph 4.4.

2. Set DB controls for an EML (expected measured level) of 0 dBm and low and high limits of 5 dB

3. Set the DIALER PROGRAM thumbwheel switch for a dialing speed of 10 digits per second, and a per cent tone (% BRK digits) of 50%. The IDT thumbwheels are not used in this application.

4. Set TT/DP/MF switch to TT.

5. Set POWER switch to ON.

6. Press RESET pushbutton located in TEST RESULTS section of front panel for at least one second.

7. Engage the following pushbuttons:

a. TEST A,
b TEST B,
c. DELAY,
d. DIAL TONE,
e. 1KHZ TONE,
f. FAULT.

8. Set RESET/→/NORM switch to RESET, then to load (→).

9. Use the keyset to enter the first digit of the number required to reach a 1-kHz tone source such as a type 102 test line. Press the WSD key, then enter the remaining digits of the number to be dialed. After the dialing number has been entered press the EON key.

10. Set RESET/→/NORM switch to NORM.

4.102 The program described in the previous paragraph conditions the analyzer to do the following.

1. Alternate test calls between channel A and channel B.

2. Dial the first digit after dial tone is detected, then wait for 4 seconds (START AFTER delay) before resuming the dialing. The 4-second pause allows the Identifier sufficient time to transmit its recognition signal. (If dial pulsing is selected the additional wait-for-start-dial period is unnecessary.)

3. Check for the presence of 1-kHz tone on the channel A or channel B line under test at a level of 0 dBm ±5 dB. The expected level selected is 0 dBm for both 600 and 900-ohm circuits.

4. Halt all testing and remain off-hook on the line under test if the analyzer detects faults.

4.103 The program described previously for routining originating registers conditions the analyzer to detect a fault if either of the following occur

1. Dial tone is not detected within approximately 3 seconds (FAULT AFTER delay) after going off-hook

2. A 1-kHz tone is not present on the line under test at a level of 0 dBm ± 5 dB within approximately 15 seconds (NETWORK delay) after dialing is completed.

4.104 When the analyzer stops testing due to a NO 1KHZ TONE fault, the Model 4101A will display the number of the originating register involved in the failed call.

4.105 Operate the Model 4101A according to information given in its instruction manual. To verify installation and programming of the analyzer, place a single test call by placing the MODE switch to SINGLE CALL. Adjust DIALING/MASTER VOLUME controls as desired.

4.106 As the analyzer places the single test call, the Model 4101A should display the number of the originating register that is receiving the dialed digits. If the analyzer (or the Model 4101A) does not perform as expected, return MODE switch to IDLE and recheck installation and programming. After proper operation has been achieved, place MODE switch to AUTO to commence automatic testing.

4.107 If the analyzer detects a fault, an alarm will be heard and a lit message lamp shows the type of fault that occurred. The analyzer remains off-hook on the line under test and all testing stops. When this occurs, pressing the appropriate TRACE pushbutton will apply a tracing tone on the line under test for troubleshooting purposes. The Model 4101A can be used to identify the originating register involved in the failed call. While the troubleshooting on one channel is in progress, testing may be resumed on the other channel by momentarily placing the MODE switch to IDLE, then returning to AUTO.

4.108 As each test call is placed, the TEST RESULTS readout increments to indicate the total number of all calls attempted. The counts stored for other test result categories are displayed in the TEST RESULTS readout when the appropriate pushbuttons are pressed. Refer to Table 4—3 for a description of each test result category.

4.109 To release the line under test and halt all testing at any time, set MODE switch to IDLE.

4.110 CONTROLS AND INDICATORS

4.111 The functions of all front panel and rear panel controls, indicators, and connectors are described in Table 4—3. The front panel controls, indicators, and connectors are identified on Figure 4—13. Figure 4—14 identifies rear panel controls and connectors.

Table 4—3. Controls, Indicators, And Connectors

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
POWER/LINE CONTROL GROUP		
J12, J13	52A	Allows use of a 52A headset for voice communication on selected line (if TALK pushbutton is engaged).
J14	A	For convenience, allows front panel connection of a single originating line (T/R or T/R/S) to the unit's channel A. The rear panel jack field is automatically disconnected when the A jack is used.
J15	B	For convenience, allows front panel connection of a single originating line (T/R or T/R/S) to the unit's channel B. The rear panel jack field is automatically disconnected when the B jack is used.
J16	BRIDGE	Allows T/R/S bridging connections to the selected call originating line. The line's internal connections to detection, holding and dialing circuits are not broken when the BRIDGE jack is used. NOTE Making level measurements (or similar tests) with external equipment via the BRIDGE jack is not recommended since the analyzer's 735-ohm termination will affect the results. The EXT jack can be used for this purpose as described in paragraph 4.112.
J17	EXT	Allows T/R/S terminating connections to the selected call originating line (only when EXT pushbutton is engaged). Engaged EXT pushbutton S7 breaks the line's internal connections to detection, holding and dialing circuits. The EXT pushbutton is a break-before-make type. To use the EXT jack with external test equipment without releasing the line under test, refer to paragraph 4.112.
M1	LINE CONTROL	Indicates dc voltage of normal or reverse polarity present on the selected call originating line.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
S1	POWER	ON position applies ac power to the unit.
S2	TALK	When engaged, allows a 52A headset to be used for voice communication on the selected call originating line. The 52A headset connects to the 52A jacks. Engaged TALK switch S2 disables the monitor amplifier.
S3	TRACE A	When engaged, places a trace tone on a selected channel A line and holds the line off-hook. Engaged TRACE A pushbutton S3 disables operation of the channel A line selector and lights the TRACE A indicator. Engaged TRACE A pushbutton S3 does not inhibit tests on channel B.
S4	TEST A	When engaged, programs the unit to perform tests on channel A.
S5	TEST B	When engaged, programs the unit to perform tests on channel B. NOTE If both TEST pushbuttons are engaged and all lines are idle, test calls will alternate between channel A and channel B. (Busy lines and empty rear panel circuit selector jacks are automatically bypassed). Also, at least one TEST pushbutton must be engaged to avoid a program error condition.
S6	TRACE B	When engaged, places a trace tone on a selected channel B line and holds the line off-hook. Engaged TRACE B pushbutton S6 disables operation of the channel B line selector and lights the TRACE B indicator. Engaged TRACE B pushbutton S6 does not inhibit tests on channel A.
S7	EXT	When engaged, connects the EXT jack to the selected call originating line. Engaged EXT pushbutton S7 breaks the line's internal connections to detection/dialing/holding circuits, and presents the EXT jack to the line in a terminating configuration. Switching is break-before-make type.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
DIALER GROUP		
S41	TT/DP/MF	Selects Touch-Tone dialing when placed in the TT position. Selects dial pulsing when placed in the DP position. The MF position selects multifrequency dialing only on units equipped with this option. Placing this switch at MF on a unit not equipped with the multifrequency option, results in a program error condition.
S42	RESET/→/NORM	When at RESET, blanks TEST PROGRESS readout U3-U13 except when unit is off-hook. The →(load) position enables entering of a number to be dialed via the keyset. Both the RESET and → (load) positions result in a program error unless MODE switch is at IDLE. The NORM position allows the MODE switch to be moved from IDLE without producing a program error.
S43	LEAK/LOOP	Sets leak impedance and loop resistance for dial pulsing. The LEAK (inner) control selects the leak impedance to be shunted across the line under test during dial pulsing. The LOOP (outer) control selects a loop resistance to be placed in series with the line under test during dial pulsing. Tables 4—1 and 4—2 list the values of leak impedance and loop resistance that can be selected with the LEAK/LOOP control. NOTE It is not typical practice to use both leak impedance and loop resistance at the same time.
S44	DIALER PROGRAM	The SPEED thumbwheels set (from 1 to 99) the number of pulses per second for dial pusling, or the number of digits per second for Touch-Tone or multifrequency dialing. The % BRK thumbwheels set (from 1 to 99) the percent break for dial pulsing or the duty cycle (tone-on period) for Touch-Tone or multifrequency dialing. The IDT thumbwheels set the interdigital time from 1 to 999 milliseconds for dial pulsing only.
S45	Keyset	Allows entry of a number to be dialed, but only when RESET/→/NORM switch is at → (load). The WSD (wait-for-start-dial) key may be used to program waits for additional dial tone (or optional wink) or start dial delay between any digits of the number to be dialed. The EON (end-of-number) key must be pressed after entering all digits of the number to be dialed.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
SYSTEM TIMING/MODE GROUP		
R3	NETWORK DLY	Sets the maximum time allowed to obtain a test OK indication from approximately 2 to 60 seconds after completion of dialing. Faults are recorded in the appropriate test categories if the test program is not satisfied and a busy or recorder tone is not detected during this [illegible]. This control is typically set for 15 seconds.
R4	TEST OK TIME	Sets the minimum time duration that a satisfactory test result must be present before a test OK is recorded. Can be set from approximatley 2 to 8 seconds. This control is typically set for 5 seconds.
R5	RECYCLE PERIOD	Sets the minimum time period the unit will be on-hook between test calls. RECYCLE PERIOD can be set for 2 to 8 seconds and is typically set for 4 seconds.
R6	DIALING/MASTER VOLUME	MASTER (outer) control sets monitor output volume at all times except when unit is dialing, or on-hook, or when a 52A headset is in use DIALING (inner) controls sets monitor output volume when unit is dialing. Monitor output is disabled when a 52A headset is in use or when unit is on-hook.
S40	MODE	IDLE position places the unit on-hook and lights the IDLE indicator. AUTO position allows repetitive test calling as programmed, except when a system hold is encountered. SINGLE CALL position, instructs the unit to remain off-hook (a system hold) after placing a single test call. To avoid a program error when MODE switch is moved from IDLE position, the RESET/→/NORM switch must be in the NORM position.
START DIAL GROUP		
R1	START AFTER	Sets time period that unit will wait before dialing begins. Can be set from approximately 2 to 8 seconds. The wait will occur only if the DELAY pushbutton is engaged. The START AFTER control is typically set for 4 seconds

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
R2	FAULT AFTER	Varies the maximum time allowed for detection of dial tone (or wink-type start dial signal on units with multifrequency option). If dial tone (or wink) is detected during FAULT AFTER period, dialing begins immediately. If neither dial tone nor wink is detected during this period, a no dial tone fault is recorded and the NO DIAL TONE indicator lights. To enable the dial tone/wink start dial function, the DIAL TONE pushbutton must be engaged. The FAULT AFTER control is typically set for 3 seconds and can be varied from approximately 1 to 7 seconds.
S9	DELAY	When engaged, programs the unit to wait for the START AFTER control delay to expire before dialing.
S10	DIAL TONE	On basic TTS 41-3A units, this pushbutton, when engaged, programs the analyzer to wait for dial tone before dialing. On units with the multifrequency option, the engaged DIAL TONE pushbutton programs the unit to wait for either dial tone or a wink-type start dial signal before dialing. (Refer to paragraph 4.29 for the start dial signals recognized by units equipped with multifrequency dialing.) The analyzer will wait for dial tone (or wink) for a maximum time determined by the FAULT AFTER setting. If a valid start dial signal is not detected during the FAULT AFTER period, a no dial tone fault is recorded and the NO DIAL TONE indicator lights. NOTE Both the DELAY and DIAL TONE pushbuttons can be engaged when desired. This program conditions the unit to: (a) begin dialing when dial tone (or wink) is received after initial off-hook, and if WSD commands are entered into the dialer, to (b) resume dialing after the START AFTER delay expires. (Detecting neither dial tone nor wink within time allowed after initial off-hook produces a no dial tone fault.) Also, at least one of the START DIAL COMMAND pushbuttons must be engaged to avoid a program error.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
TEST PROGRAM GROUP		
S11	OPEN C-LEAD	When engaged, programs the unit to record an open C-lead fault and light the OPEN "C" LEAD indicator if an open C-lead is detected.
S12	REV DRNG-DIAL	When engaged, programs the unit to record as a fault any tip/ring polarity reversal which occurs during dialing. The REV DRNG DIAL indicator lights if the unit detects this condition.
S13	LO-LIMIT	Sets the minimum accpetable level of a detected 1-kHz tone with respect to programmed EML (S14). If the level of a detected 1-kHz tone is less than the EML setting by an amount greater than the LO-LIMIT setting (in dB), a low level fault is recorded and the LO-LEVEL indicator lights. The 1KHZ TONE pushbutton must be engaged to enable this function.
S14	EML	Sets the expected measured level (in − dBm) of a 1-kHz tone to be detected. If a detected 1-kHz tone varies from the EML setting by an amount outside upper and lower limits (set by LO-LIMIT S13 and HI-LIMIT S15) a fault is recorded in the appropriate category and the appropriate indicator lights. If no 1-kHz tone above −31 dBm is detected during NETWORK DLY (R3) time period following dialing, then the NO 1KHZ TONE message lights and the fault is recorded. The 1KHZ TONE pushbutton must be engaged to enable this function. NOTE The expected level will be as selected by the EML control for both 600 and 900-ohm circuits.
S15	HI-LIMIT	Sets the maximum acceptable level of a detected 1-kHz tone with respect to programmed EML (S14). If a detected 1-kHz tone exceeds the EML setting by an amount greater than the HI-LIMIT setting (in dB), a high level fault is recorded and the HI LEVEL indicator lights. The 1KHZ TONE pushbutton must be engaged to enable this function.
S16	1KHZ TONE	When engaged, programs the unit to record a no 1-kHz tone fault and light NO 1KHZ TONE indicator if the unit fails to detect a 1-kHz tone within the NETWORK DLY (R3) time period after dialing. The level of a 1-kHz tone must be greater than −31 dBm (from either 600 or 900-ohms) to be detected.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
		The unit also determines if the 1-kHz tone level varies from the EML control S14 setting by an amount outside upper and lower limits set by LO-LIMIT control S13 and HI-LIMIT control S15. If either limit is exceeded, an appropriate fault is recorded and the corresponding indicator lights.
S17	ANS SUP	When engaged, programs the unit to record a no answer fault and to light the NO ANSWER indicator if tip/ring polarity reversal (answer) did not occur within the NETWORK DLY (R3) time period after dialing.
S18	INC CKT	When engaged, programs the unit to receive a test call via its internal test line. If the internal test line fails to detect a call within the NETWORK DLY (R3) time period after dialing, then an incoming circuit fault is recorded and the INC CKT FAULT indicator lights. NOTE At least one of the following switches must be engaged to avoid a program error: 1KHZ TONE S16, ANS SUP S17, and INC CKT S18.
S19	HOLD ON REORDER	When engaged, will cause unit to stop automatic recycling and remain off-hook if reorder tone is detected and false tip/ring polarity reversal (answer) is not detected. Both REORDER and SYSTEM HELD indicators light when this condition occurs.
S20	HOLD ON BUSY	When engaged, will cause unit to stop automatic recycling and remain off-hook if busy tone is detected and false tip/ring polarity reversal (answer) is not detected. Both BUSY and SYSTEM HELD indicators light when this condition occurs.
S21	HOLD ON R OR B + ANSWER	When engaged, will cause unit to stop automatic recycling and remain off-hook if false tip/ring polarity reversal (answer) is detected and either busy or reorder tone is also detected. SYSTEM HELD indicator and either REORDER + ANSWER indicator or BUSY + ANSWER indicator will light when this condition occurs.
S22	HOLD ON FAULT	When engaged, will cause the unit to stop automatic recycling and remain off-hook if any fault (not busy or reorder tone) is detected. The SYSTEM HELD indicator and the appropriate fault indicator will light when this condition occurs

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
S23	HOLD ON MANUAL	When engaged, will cause the unit to stop automatic recycling and remain off-hook after completing the current test. The SYSTEM HELD indicator lights when this pushbutton is engaged. Also, the unit's alarm tone is disabled if a HOLD ON MANUAL is selected.
LINE DISPOSITION GROUP		
CR64	TEST A	Lights to indicate unit has gone off-hook after selecting an idle channel A line.
CR66	TEST B	Lights to indicate unit has gone off-hook after selecting an idle channel B line
CR67	IDLE A	When lit indicates the selected channel A line is idle. (Sleeve lead open circuit or more negative then −11V.)
CR68	IDLE B	When lit indicates the selected channel B line is idle. (Sleeve lead open circuit or more negative than −11V.)
CR69, 70	TRACE A	Lights when the TRACE A pushbutton is pressed. Indicates a tracing signal is present on the selected channel A line.
CR71, 72	TRACE B	Lights when the TRACE B pushbutton is pressed. Indicates a tracing tone is present on the selected channel B line
CR73	BUSY A	When lit indicates the selected channel A line is busy. (Sleeve lead at ground potential or more positive than −7V.)
CR74	BUSY B	When lit indicates the selected channel B line is busy. (Sleeve lead at ground potential or more positive than −7V.)
U1	CHAN A	Indicates the number of the selected channel A line.
U2	CHAN B	Indicates the number of the selected channel B line.
TEST PROGRESS GROUP		
CR33-38	INTER-DIGITAL PERIOD	Lights during time interval between dialing digits only when unit is dial pulsing.
CR39	IDLE	Lights to indicate unit is on-hook when the MODE switch is in the IDLE position.
CR40, 41	ON HOOK	Lights to indicate unit is on-hook when the MODE switch is in the AUTO or SINGLE CALL position.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
CR42	TTY	Not used in basic TTS 41-3A unit. Provided for use in conjunction with a future remote output option.
CR43-48	WAITING FOR START DIAL	When lit indicates: 1. Unit is waiting for a programmed delay to expire before dialing if the DELAY pushbutton is depressed. 2. Unit is waiting for dial tone (or wink-type start dial signal) before dialing if the DIAL TONE pushbutton is depressed. 3. If both DELAY and DIAL TONE are engaged, this message is displayed after initial off-hook to indicate unit is waiting for 2 above before dialing. If WSD command(s) are encountered during the dialing process, this message is displayed again to indicate unit is waiting for 1 above before resuming the dialing.
CR49, 50	DIALING	When lit indicates unit is sending dialing signaling (either Touch-Tone, dial pulse, or multifrequency).
CR51-59, 63, 65	DIALING COMPLETED WAITING FOR TEST RESULTS	Lights when dialing is completed. Remains lit until unit determines results of test program.
CR61-62	TEST OK	Lights to indicate that a test call encountered none of the faults unit is programmed to detect. Remains lit until current test cycle is completed and unit returns to on-hook.
CR75-77	SYSTEM HELD	Lights if, for any reason, unit is not automatically recycling.
U3-13	TEST PROGRESS	Displays digits of the number to be dialed. Digits are displayed at half brightness when entered via the keyset. Each digit is brought up to full brightness when dialed out by the unit.
TEST RESULTS GROUP		
CR78-80	OVER RANGE	Lights when total tests category exceeds a count of 9999. To remove the over range indication, the RESET pushbutton is pressed with MODE switch in IDLE position. This action also resets all test result categories to zero.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
CR81-85	POWER INTERRUPT	Flashes to indicate unit's power has been momentarily removed. The off (down) to ON transition of the POWER switch also causes this indicator to flash. When the power interruption indication occurs, the PROGRAM ERROR indicator lights and the unit is held on-hook. To remove power interrupt indication, depress RESET [illegible] button with MODE switch in IDLE position for at least one second. The dialing number must be reprogrammed after a power interrupt occurs.
CR 86, 87, 89, 90	PROGRAM ERROR	Lights to indicate incorrect operation of the unit. A program error occurs when a test program is incorrect, or insufficient, or MODE switch is removed from IDLE position while RESET/→/NORM switch is in the → (load) or RESET positions. (See paragraph 4.56.) A program error indication also occurs when a power interrupt condition exists. Unit remains on-hook until program error is corrected.
CR91	NO DIAL TONE	Lights to indicate dial tone was not returned on the selected line within programmed FAULT AFTER (R2) time period. The DIAL TONE pushbutton must be engaged to detect this condition. On units equipped with multifrequency option, this message can also indicate an expected wink-type start dial signal was not received within the FAULT AFTER period when the DIAL TONE pushbutton is engaged.
CR92	OPEN "C" LEAD	When lit indicates C-lead open circuit or potential more negative than −11 volts occurred during dialing or while test results were being determined. To detect this condition, the OPEN C-LEAD pushbutton must be engaged.
CR93	REV DRNG DIAL	Lights to indicate a tip/ring polarity reversal occurred while dialing. To detect this condition, the REV DRNG DIAL pushbutton must be engaged.
CR94	REORDER	Lights when unit detects reorder tone without false tip/ring polarity reversal (answer) while waiting for dial tone or when test results are being determined.
CR95	REORDER + ANSWER	Lights when unit detects both reorder tone and false tip/ring polarity reversal (answer) while waiting for dial tone or when test results are being determined.
CR96	BUSY + ANSWER	Lights when unit detects both busy tone and false tip/ring polarity reversal (answer) while waiting for dial tone or when test results are being determined.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
CR97	BUSY	Lights when unit detects busy tone without false tip/ring polarity reversal (answer) while waiting for dial tone or when test results are being determined.
CR98	LO LEVEL	Lights when level of a received 1-kHz tone is less than the threshold level set by combination of EML control S14 and LO-LIMIT control S13. To detect this condition the 1KHZ TONE pushbutton must be engaged.
CR99	NO 1KHZ TONE	Lights to indicate that a 1-kHz tone having level above −31 dBm (from either 600 or 900-ohms) was not received during NETWORK DLY (R3) time period following completion of dialing. To detect this condition, the 1KHZ TONE pushbutton must be engaged.
CR100	HI LEVEL	Lights when level of received 1-kHz tone is greater than the threshold level set by combination of EML control S14 and HI-LIMIT control S15. To detect this condition, the 1KHZ TONE pushbutton must be engaged.
CR101	NO ANSWER	Lights when unit does not receive a tip/ring polarity reversal (answer) within NETWORK DLY (R3) time period following completion of dialing. To detect this condition the ANS SUP pushbutton must be engaged.
CR102	INC CKT FAULT	Lights when unit does not receive a test call placed to its internal test line during NETWORK DLY (R3) time period following completion of dialing. To detect this condition, the INC CKT pushbutton must be engaged.
S24	RESET	When pressed, resets counts in all test result categories to zero, also removes any power interrupt and over range indications. Reset can occur only when the MODE switch is in the IDLE position. NOTE To remove the POWER INTERRUPT indication, the RESET pushbutton should be pressed for at least one second.
S25	OK	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all tests which resulted in a test OK.
S26	A	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all tests attempted on channel A.
S27	B	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all tests attempted on channel B.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
S28	NO DIAL TONE	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all no dial tone (or no wink) faults detected.
S29	OPEN "C" LEAD	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all open C-lead faults detected.
S30	REV BAT C-LEAD	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all tip/ring polarity reversal during [illegible].
S31	REORDER	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all reorder tone detections without false tip/ring polarity reversal (answer).
S32	REORDER + ANSWER	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all reorder tone detections which were accompanied by false tip/ring polarity reversal (answer) detections.
S33	BUSY + ANSWER	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all busy tone detections which were accompanied by false tip/ring polarity reversal (answer) detections.
S34	BUSY	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all busy tone detections without false tip/ring polarity reversal (answer).
S35	LO LEVEL	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all low level faults detected.
S36	NO 1KHZ TONE	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all no 1-kHz tone faults detected.
S37	HI LEVEL	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all high level faults detected.
S38	NO ANSWER	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all no answer faults detected.
S39	INC CKT FAULT	When pressed, TEST RESULTS readout U14-U17 will indicate the count of all incoming circuit faults detected.
U14-U17	TEST RESULTS	Normally displays total count of all tests attempted on both channel A and channel B. The count accumulated in any other test result category is displayed when the appropriate test result pushbutton is pressed.

Table 4—3. (cont'd)

REFERENCE DESIGNATION	NOMENCLATURE	FUNCTION
REAR PANEL GROUP		
F1, F2	fuses	Protect analyzer against excessive input current. Use 2-ampere slow-blow fuses for 115 Vac operation. Use 1-ampere slow-blow fuses for 230 Vac operation.
J1-J8	CHANNEL A 0-7	Up to eight telephone lines (T/R or T/R/S) may be connected to this jack field for test call origination via unit's channel A. Unit scans and selects lines under program control. Connections are made via 310 type jacks. Any empty jacks appear busy to the unit and are skipped by the line scanning/selection circuits.
J9-J16	CHANNEL B 0-7	Up to eight telephone lines (T/R or T/R/S) may be connected to this jack field for test call origination via the unit's channel B. Unit scans and selects lines under program control. Connections are made via 310 type jacks. Any empty jacks appear busy to the unit and are skipped by the line scanning/selection circuits.
J17	POWER	Unit's input power cord connects to this jack.
S1	SELECT VOLTAGE	Configures the unit for either 115 or 230 Vac operation. The proper fuses must be used for each power source as noted on the rear panel.
TB1	INCOMING CIRCUIT	The T, R, S terminals provide tip/ring/sleeve connections to the unit's internal test line. The XA and XB terminals are not used.

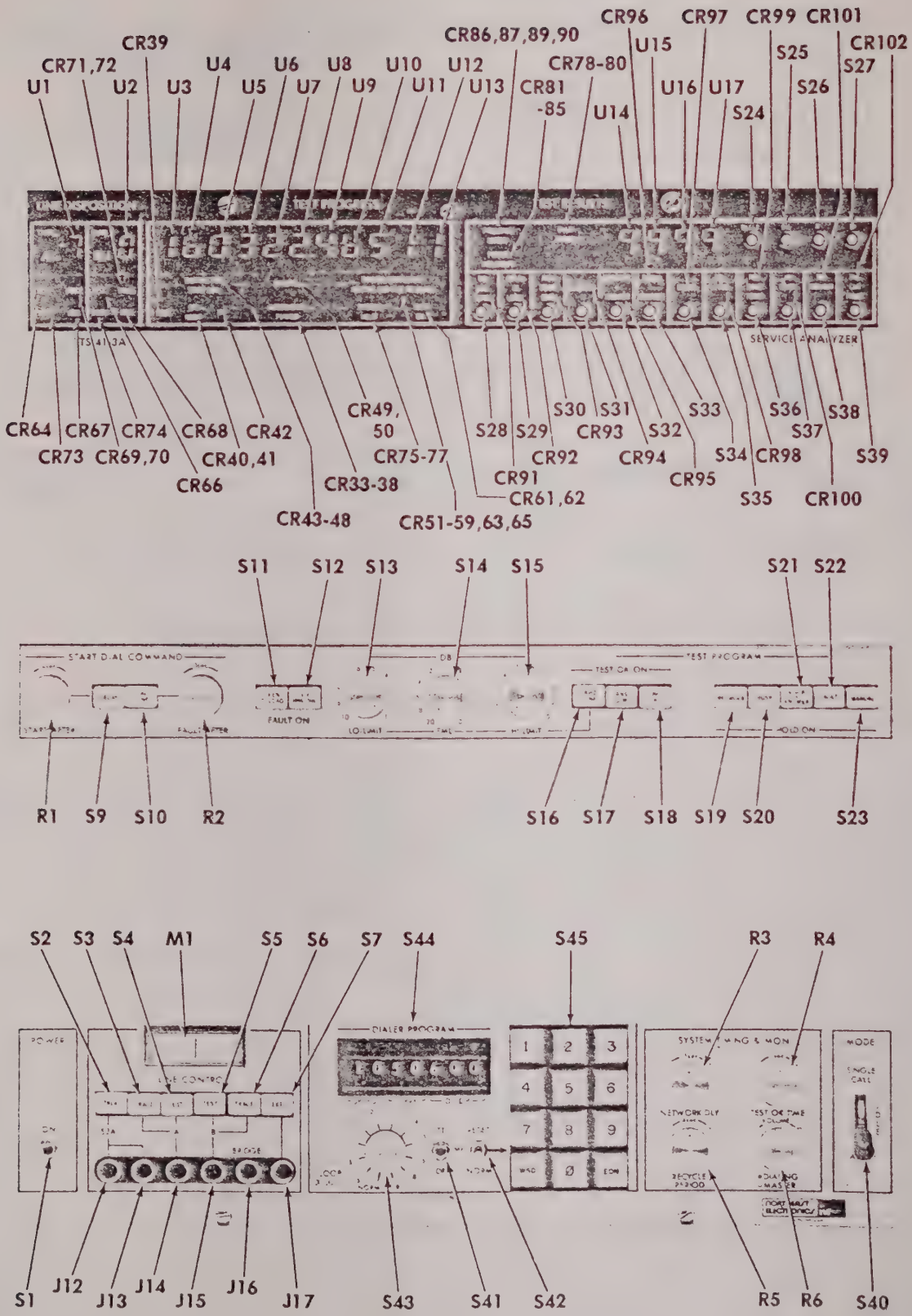


Figure 4—13. Model TTS 41-3A Front Panel Controls And Indicators

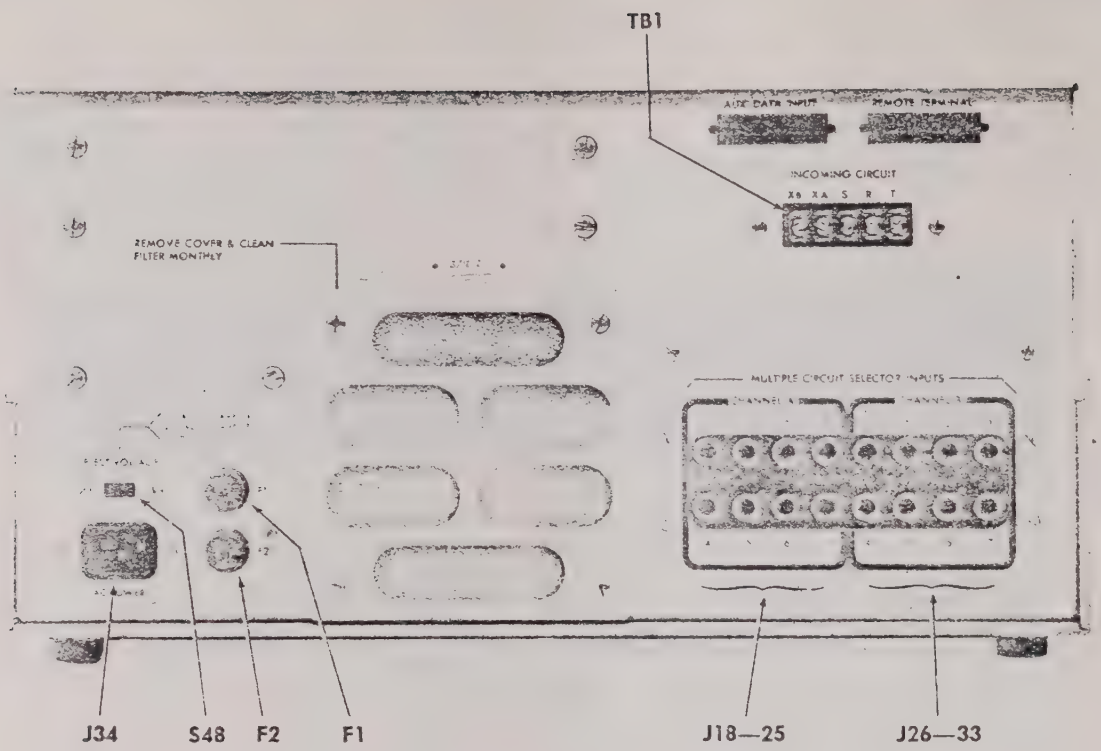


Figure 4—14. Model TTS 41-3A Rear Panel Connectors

4.112 TESTING WITH EXTERNAL EQUIPMENT ON A LINE HELD BY THE ANALYZER

4.113 The analyzer automatically applies a 735-ohm termination to the selected call origination line when off-hook. This 735-ohm termination can affect testing (such as transmission level measurements) performed by external equipment. By using the following procedure, the 735-ohm termination can be isolated from the line under test while tests are being made with external equipment.

4.114 To make transmission level measurements (or similar tests) with external equipment on a line held by the analyzer, perform the following steps.

1. Using a patch cord with a type 310 plug, connect the external test equipment to the analyzer's EXT jack.

2. Select the required termination/impedance and dc holding with the external test equipment.

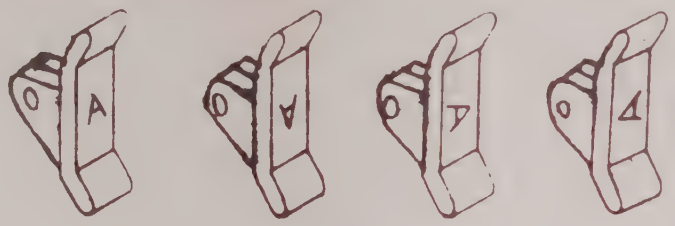
3. Engage the TRACE pushbutton for the channel associated with the line under test. (This action applies a holding circuit to the line under test while the line is being switched to external equipment).

4. Engage the analyzer's EXT pushbutton.

5. Release the TRACE pushbutton engaged previously.

6. The external equipment should now be providing dc holding for the line under test. The analyzer's 735-ohm termination is isolated from the line. Tests can be performed with the external equipment at this time.

STYLE 1 STYLE 2 STYLE 3 STYLE 4



NOTE:

1) For ejector tab kit, mark ejector tabs 5/32 inch high, centered on tab as shown with number(s) per Table I.

2) Letter "A" on tab, designates direction in which the legend will be oriented.

TABLE I

EJECTOR TAB MARKING

LEGEND - MARKING	STYLE	MARKING COLOR	QUANTITY
1	1	BLACK	1
2	1	"	1
———	———	———	———
4	1		1
5	1		1
6	1		1
7	1		1
8	1		1
9	———		———
10	1		1
1	2		1
2	2		1
4	2		1
5	2		1
6	2		1
7	2		1
8	2		1
9	2		1
10	2		1

TABLE

EJECTOR TAB MARK

LEGEND - MARKING	STYLE	

BRUNING 40-105-28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
○	ORIGINAL ISSUE	9-22-77	SKN

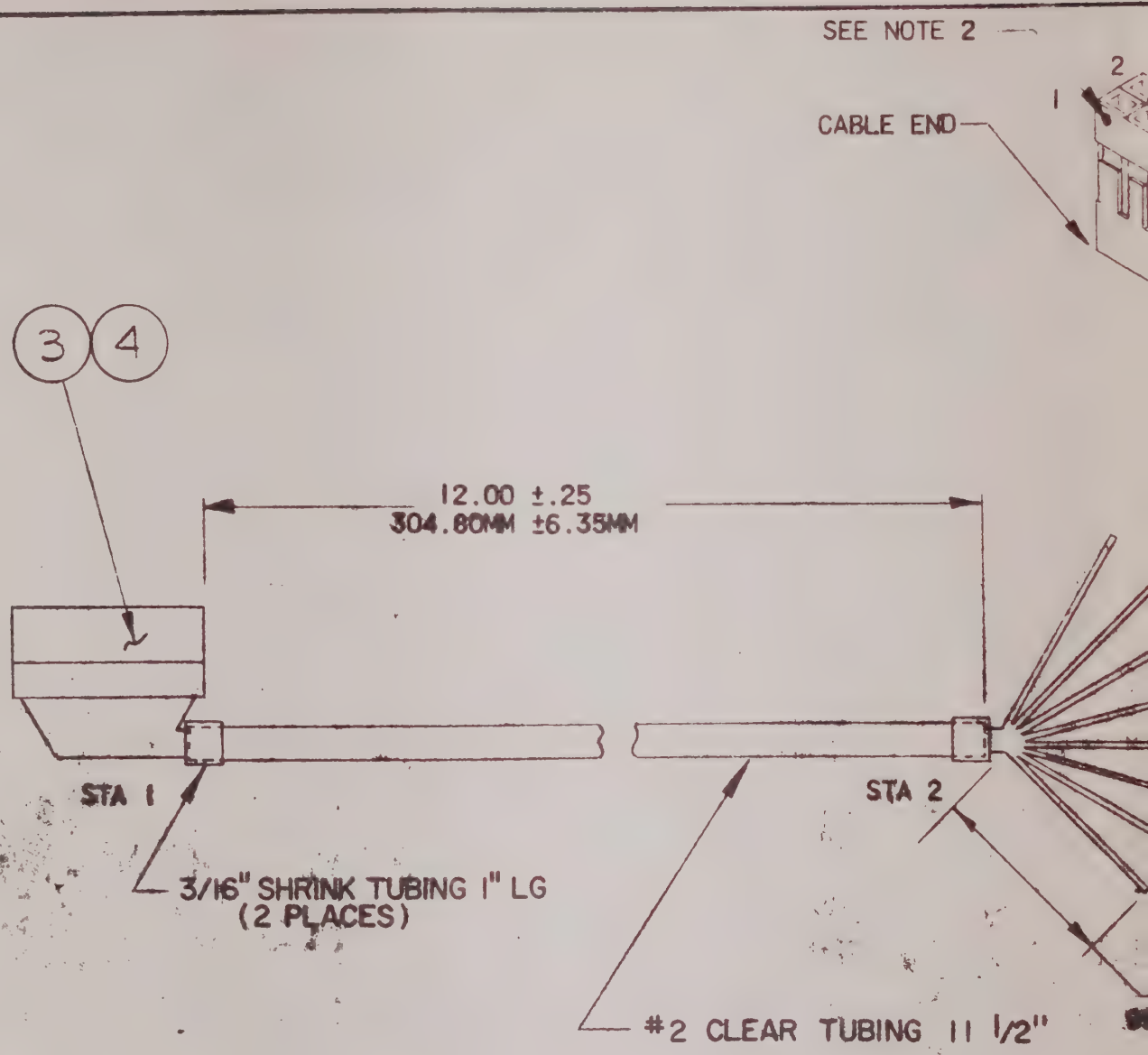
ING	
MARKING COLOR	QUANTITY

OCT 22 1979

REPAIR

NORTHEAST ELECTRONICS inc.
CONCORD NH U.S.A.

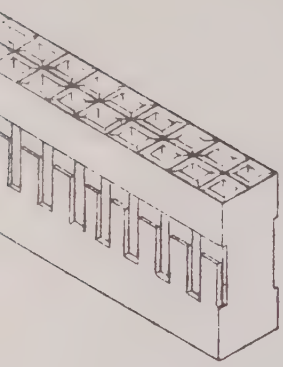
DRAWN BY HLB	SCALE —	
ENGR. SKN	DATE 8-10-77	
EJECTOR TAB KIT	DRAWING NO. B-0041-13-054	REV ○



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	ADDED NOTE 2 P/N 298	[illegible]	SKN
2	ADD TUBING & CORRECT CONN P/N (23)	2-28-79	[illegible]
3	[illegible]	8-30-79	PWD.



REPAIR

OCT 22 1979

3.75 ±.25
25MM ±6.35MM

2. ADD RED DOT OR EQUIVALENT TO CONNECTOR AS PIN #1 INDICATOR.

1. ALL DIMENSIONS IN MM ARE ±.38 UNLESS OTHERWISE SPECIFIED.

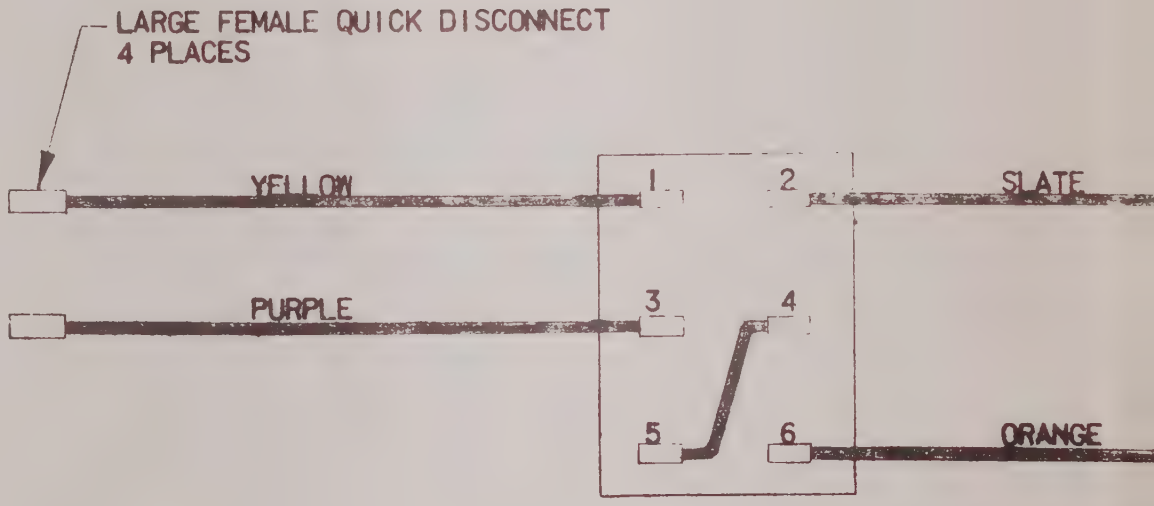
NOTES

TITLE

SYSTEM TIMING CABLE LAYOUT

NORTHEAST ELECTRONICS INT

FINISH — ETCH AND IRIDITE	MATERIAL	DRAWN MCF	DATE 6/9/77	SCALE —
PAINT — FEDERAL SPEC. 595 COLOR 26492	ALUMINUM 5052 H34 3003 H14	CHECKED [illegible]		DATE 7-13-77
R AND S VINYL 8050, W24		APPROVED SKN		DATE 7-21-77
SCREEN PER HARNESS SHEET A 0041-13-025		SIZE B	NUMBER 0041-13-026	ISSUE 3

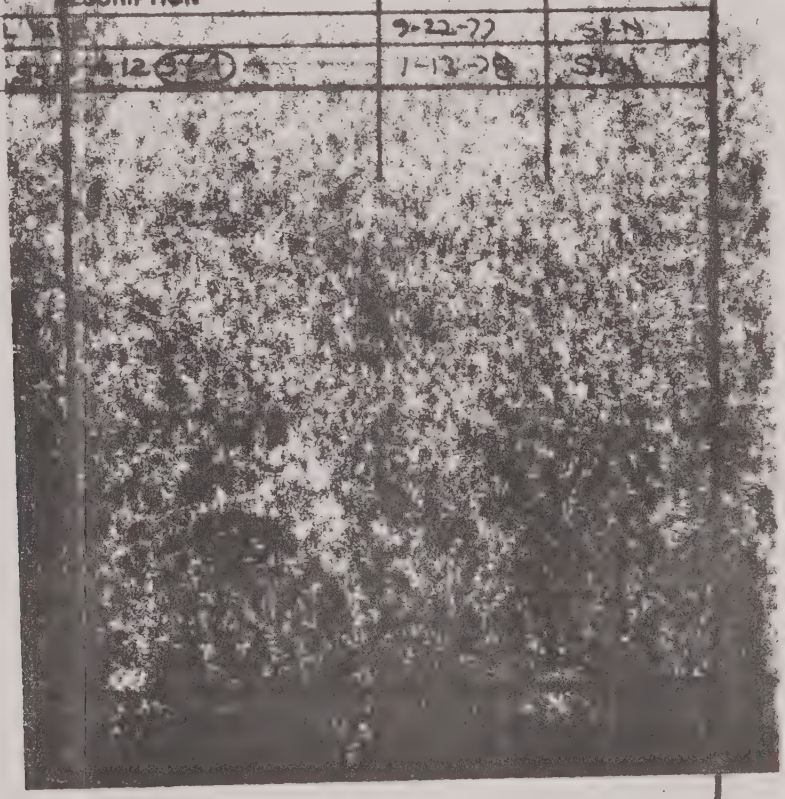


S41

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS				
NO.		DESCRIPTION	DATE	APPROVAL
C	ORIG		9-22-77	SLN
1	ADDED		1-13-78	SLN



REPAIR

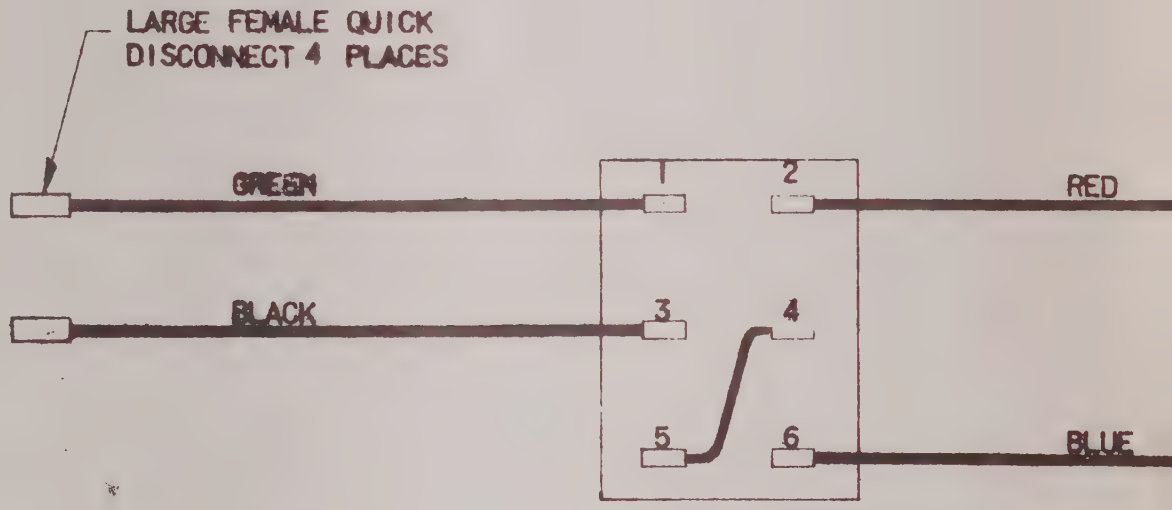
OCT 22 1979

2. SWITCH POSITION WITH KEYWAY DOWN.

1. ALL WIRES TO BE 22 GAUGE STRANDED, 4.00 ±.25 LONG.

NOTES

TITLE			
DIAL MODE SWITCH ASSEMBLY			NORTHEAST ELECTRONICS int
~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~		DRAWN MCF DATE 7/12/77 SCALE —
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052-H34 3003-H14~~		CHECKED DPC DATE 7-13-77
~~R AND S VINYL 8060, W24~~			APPROVED SLN DATE 7-21-77
~~SCREEN PER~~			SIZE B NUMBER 0041-13-027 ISSUE 1



S42

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	ADDED S42 4/0 12 (369)	1-13-78	SKN

REPAIR

OCT 22 1979

2. SWITCH POSITIONED WITH KEYWAY DOWN.

1. ALL WIRES TO BE 22 GAUGE STRANDED 6.0 INCHES LONG. ±.125

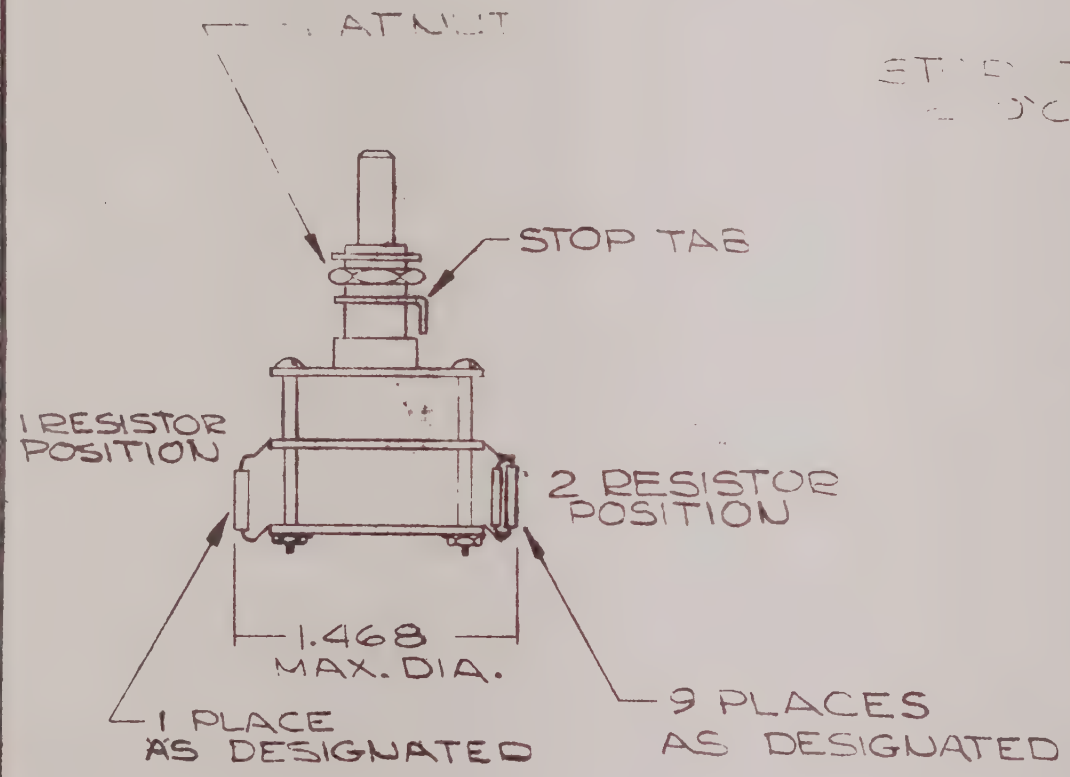
NOTES

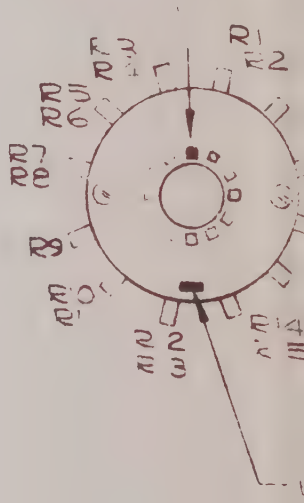
TITLE

RST LOAD NORM SWITCH ASSEMBLY

NORTHEAST ELECTRONICS

FINISH — ETCH AND IRIDITE	MATERIAL	DRAWN MCF	DATE 5/11	SCALE 4:1
PAINT — FEDERAL SPEC. 595 COLOR 26492	ALUMINUM 5052 H34 3003 H14	CHECKED D.P.	DATE 9-23-77	
R AND S VINYL 8050, W24		APPROVED SKN	DATE 9-21-77	
SCREEN PER		SIZE B	NUMBER 0041-13-028	ISSUE 1

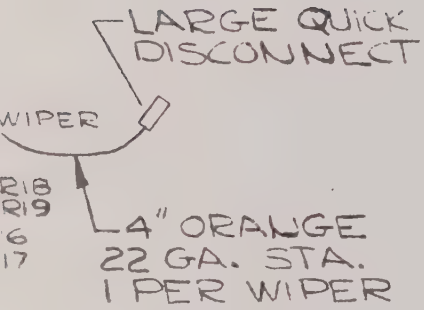




UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNTING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9-22-77	[illegible]
1	ADDED NOTE 1 S136	11/11/78	[illegible]



R18
R19
6
17

OCATING TAB
5 O'CLOCK

OCT 22 1979

REPAIR

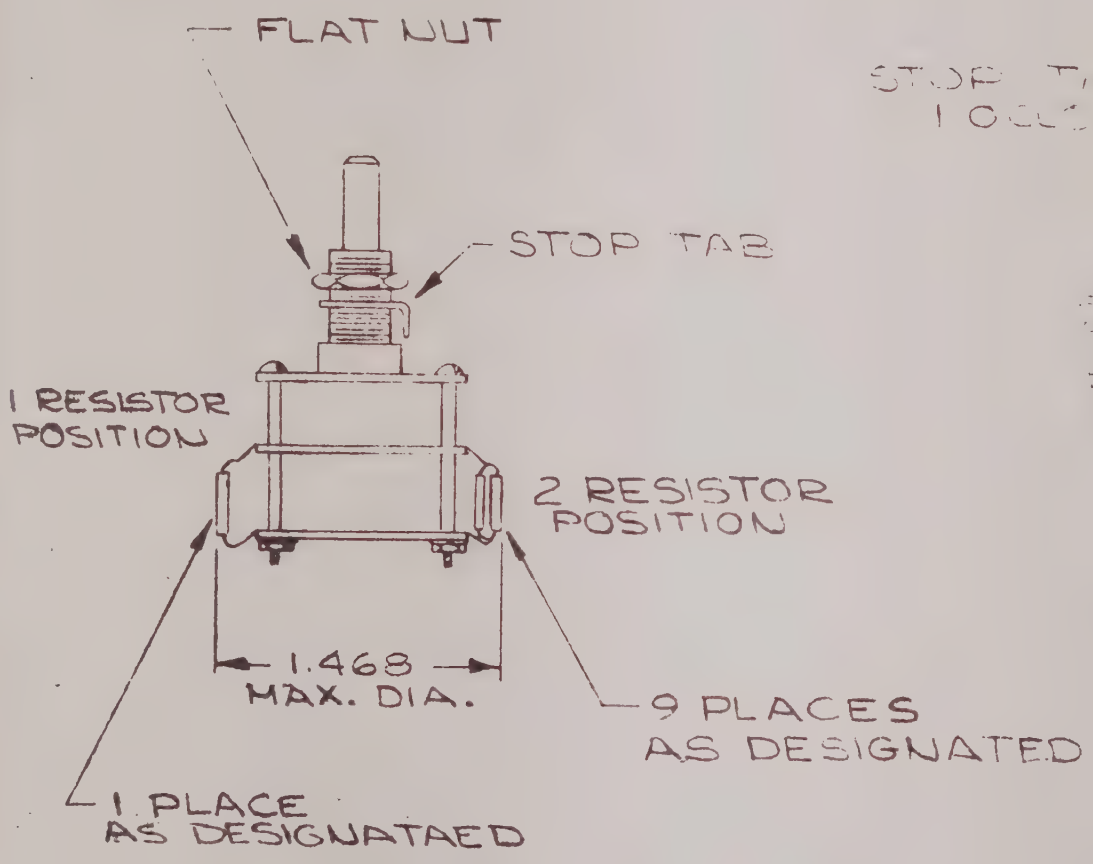
1. MOUNT COMPONENTS AS CLOSE TO SWITCH AS POSSIBLE.

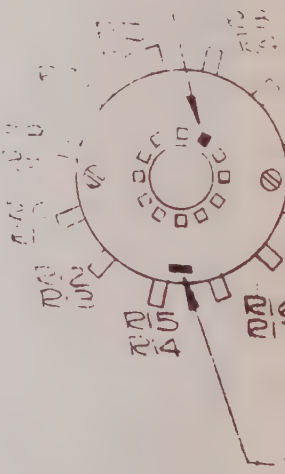
NOTES

TLE
LO LEVEL SWITCH ASS'Y

NORTHEAST ELECTRONICS

~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF	DATE 3/9/77 SCALE ~
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34~~	CHECKED [illegible]	DATE 7-13-77
~~R AND S VINYL 8060, W24~~	~~3003 H14~~	APPROVED [illegible] N	DATE 7-21-77
~~CREEN PER~~		SIZE B	NUMBER C041-[illegible]029 ISSUE 1





UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9-22-77	
1	ADDED NOTE 1 S-136	11/11/71	

[illegible] DISCONNECT

WIPER

R18
R19

5½" YELLOW
22 GA STRANDED
1 PER WIPER

LOCATING TAB
6 O'CLOCK

REPAIR OCT 22 1979

1. MOUNT COMPONENTS AS CLOSE TO SWITCH AS POSSIBLE.

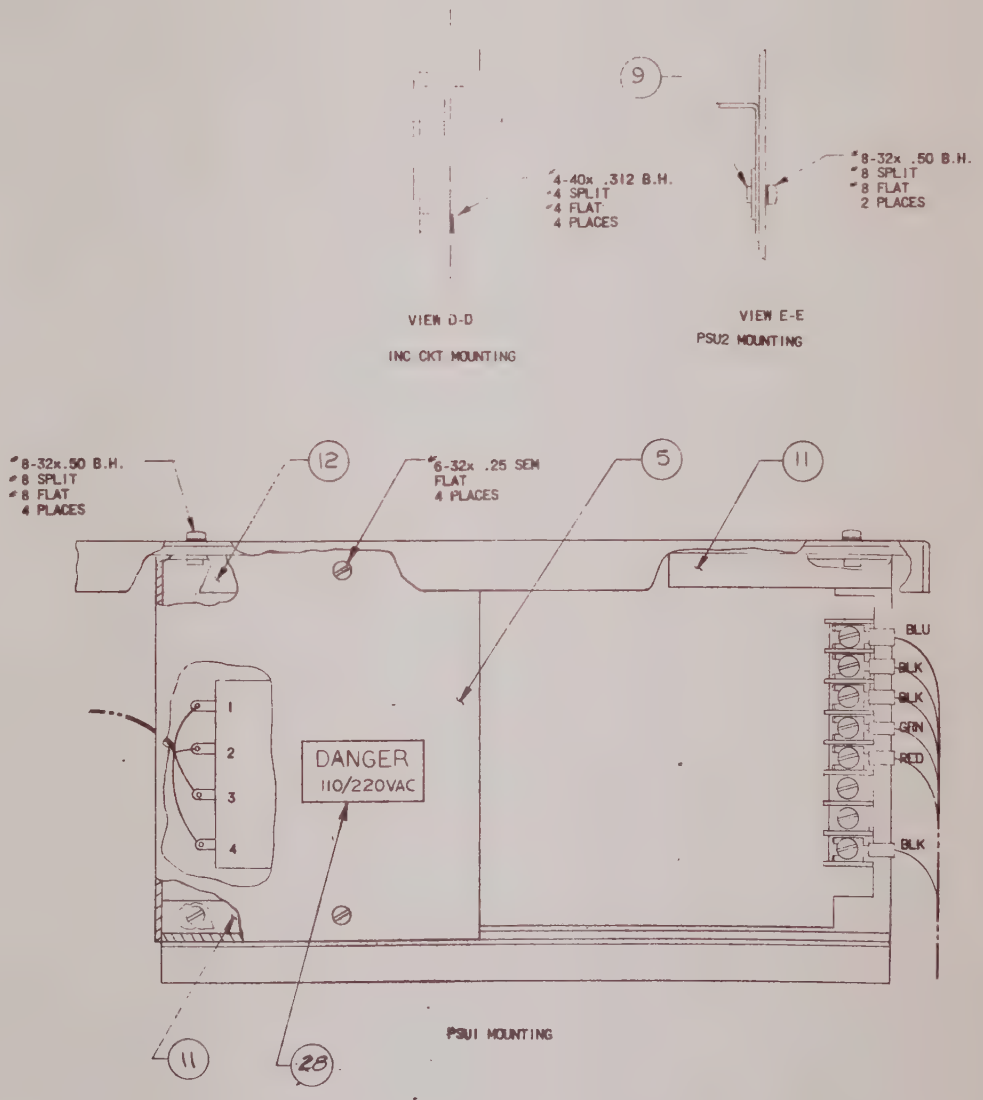
NOTES

TITLE

EML SWITCH ASS'Y

NORTHEAST ELECTRONICS int

~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF	DATE 3/9/77 SCALE
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	ALUMINUM ~~5052 H34~~ ~~3003 H14~~	CHECKED	DATE 3-13-
~~R AND S VINYL 8050, W24~~		APPROVED SKN	DATE 3-21-77
~~SCREEN PER~~ [illegible]	[illegible] 33	SIZE B	NUMBER 0041-13-030 ISSUE 1


9
4-40x .312 B.H.
4 SPLIT
4 FLAT
4 PLACES
8-32x .50 B.H.
8 SPLIT
8 FLAT
2 PLACES
VIEW D-D
INC CKT MOUNTING
VIEW E-E
PSU2 MOUNTING
8-32x.50 B.H.
8 SPLIT
8 FLAT
4 PLACES
12
6-32x .25 SEM
FLAT
4 PLACES
5
11
BLU
BLK
BLK
GRN
RED
BLK
1
2
3
4
DANGER
110/220VAC
11
28
PSU1 MOUNTING

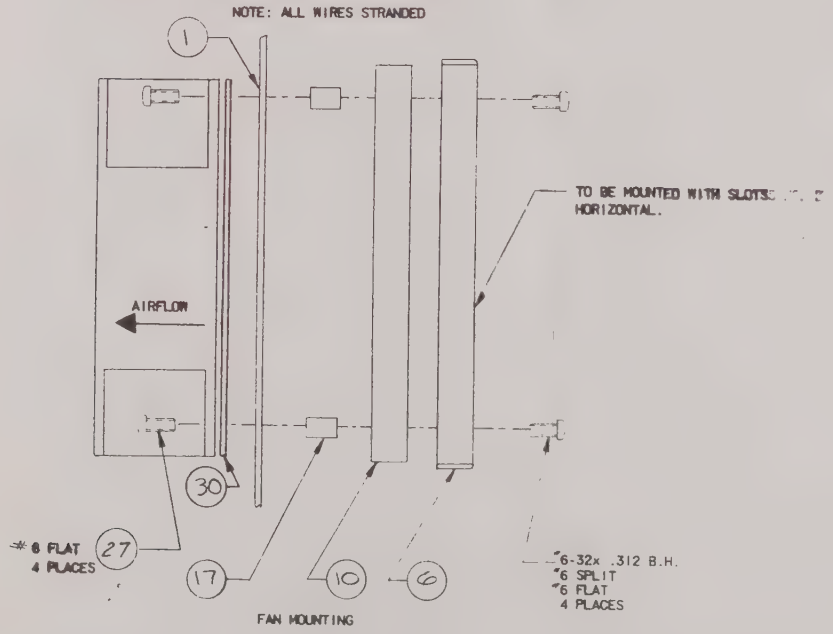
REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
1)	ORIGINAL ISSUE	9	

AC WIRING

FROM	TO	COLOR	GA.	LENGTH
J34-L	XF1-1	GRAY	22	2"
J34-N	XF2-1	GRAY		2 1/2"
XF1-2	S46-COM1	GRAY		5"
XF2-2	S46-COM2	GRAY		4"
S46-01	P39-1	GRAY		10"
S46-02	P38.3	BLUE		10"
PSU1-1	PSU2-1	RED		13"
PSU1-2	PSU2-2	YEL		13"
PSU1-3	PSU2-3	ORANGE		13"
PSU1-4	PSU2-4	GREEN		13"
S48.3	PSU2.1	RED		3"
S48.3	P39.2	RED		12"
S48.4	PSU2.3	ORANGE		3"
S48.2	PSU2.2	YEL		3"
S48.6	PSU2.4	GRN		3"
S48.6	P39.4	GRN		12"
PSU2-2	FAN PLUG (RIBBED)	BLACK		6"
PSU2.4	FAN PLUG (SMOOTH)	BLACK		6"

SLEEVE WITH #6 CLEAR TUBING

NOTE: ALL WIRES STRANDED



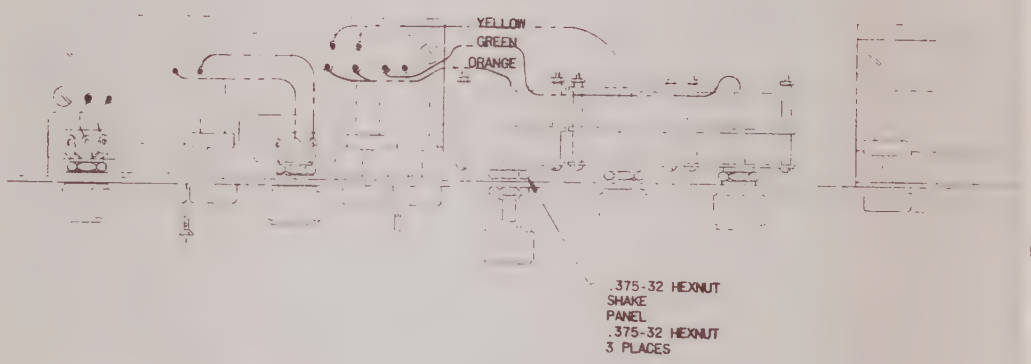
FAN MOUNTING

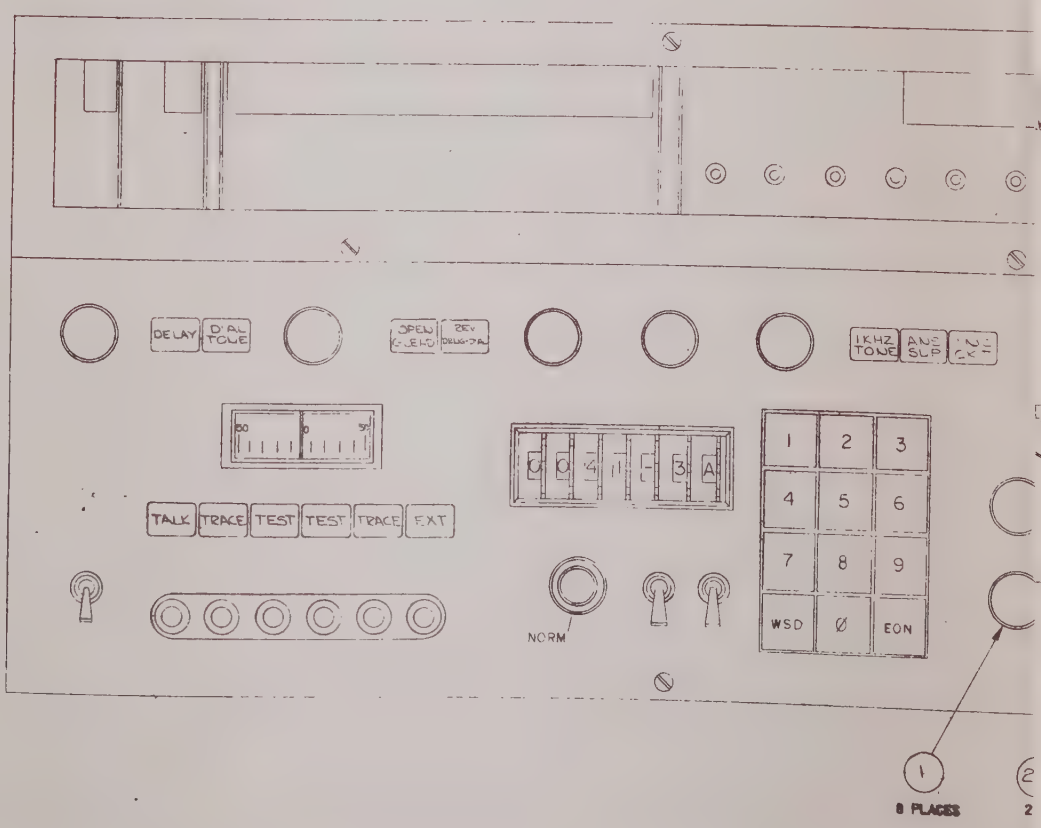
T 22 1979

REPAIR

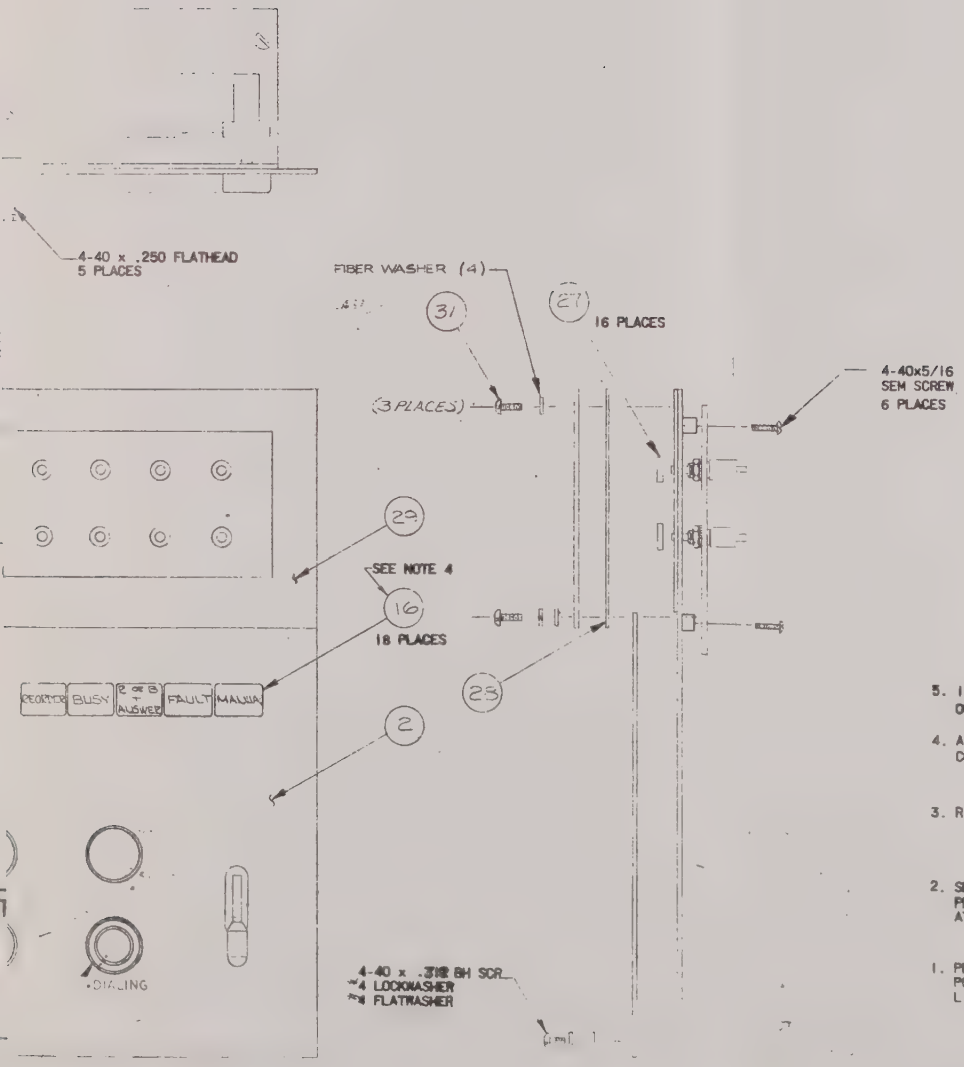
NOTES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: REAR PANEL ASSEMBLY	NORTHEAST ELECTRONICS INC
ALL TOLERANCES ARE ± .015		
ALL BENDS ARE 90° ± ½°		
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MATL .128, 3/32 RAD	FINISH — ETCH AND IRIDITE; PAINT — PEDGRAL SPEC. 595 COLOR 24472; R AND S VINYL 8050, W24	MATERIAL: ALUMINUM 5052 H34, 3003 H14
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	SCREEN PER	DRAWN — DATE — SCALE — CHECKED — DATE — APPROVED — DATE — SIZE D — NUMBER 0041-13-046 — SHT 2 OF 2


YELLOW
GREEN
ORANGE
.375-32 HEXNUT
SHAKE
PANEL
.375-32 HEXNUT
3 PLACES


DELAY
DIAL TONE
OPEN CIRCUIT
REV BATTERY
1KHZ TONE
AUTO SLP
TALK
TRACE
TEST
TEST
TRACE
EXT
NORM
1
2
3
4
5
6
7
8
9
WSD
0
EON
1
8 PLACES

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9-[illegible]	[illegible]



5. INSURE LEDS ARE STRAIGHT PRIOR TO ASSEMBLY OF DISPLAY BOARD.

4. ATTACH PUSHBUTTON CAPS USING APPROPRIATE CONCACT CEMENT.

3. R1-5 MAY HAVE RANDOM KNOB ORIENTATION.

2. SET R6 TO MOST COUNTER CLOCKWISE POSITION, PLACE KNOB WITH POSITION INDICATE LINE AT SOLID DOT (DIALING) ON SCREEN.

1. PLACES S13-15,43 IN MOST COUNTER CLOCKWISE POSITION, INSTALL KNOBS WITH POSITION INDICATE LINE ON MOST COUNTER CLOCKWISE SCREENED DIGIT.

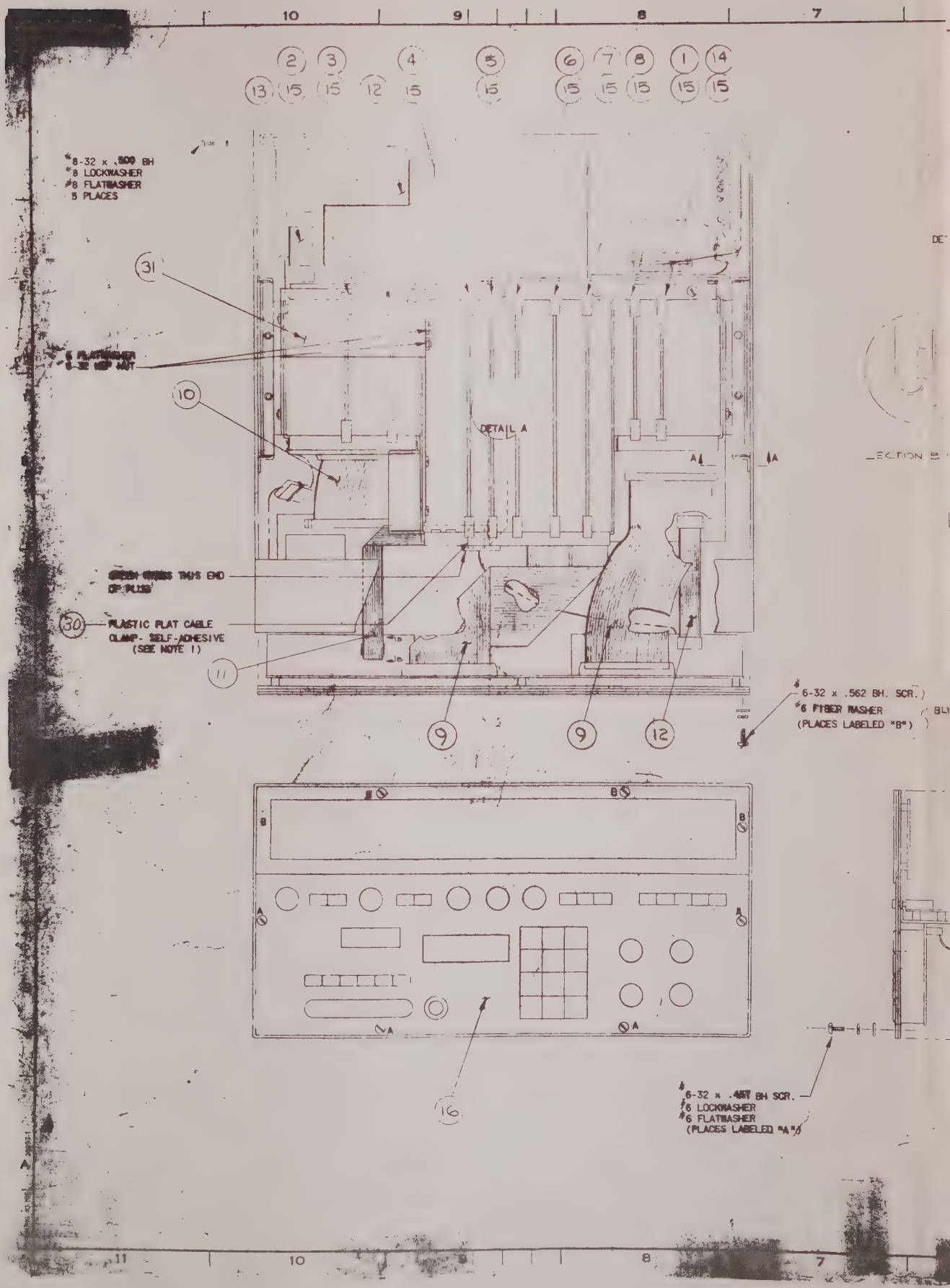
OCT 22 1979

REPAIR

NOTES

PLACES

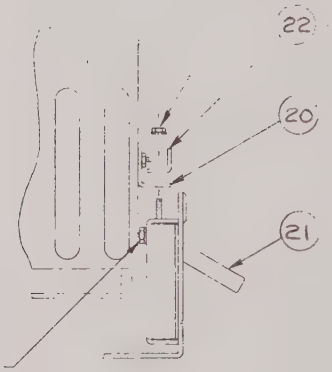
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: FRONT PANEL ASSEMBLY	NORTHEAST ELECTRONICS	
ALL TOLERANCES ARE ± .015		DRAWN [illegible] DATE [illegible]	SCALE 2/1
ALL BENDS ARE 90° ± ½°		CHECKED [illegible]	DATE [illegible]
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS 1/64 RAD MAT'L .125, 1/32 RAD	FINISH — ~~ETCH AND ANODIZE~~ PAINT — FEDERAL SPEC. STD COLOR 24492 R AND S VINYL 8080, W34	MATERIAL: ALUMINUM ~~5052 H34~~ ~~2003 H14~~	APPROVED [illegible] DATE 7-22-97
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	SCREEN #68		SIZE D NUMBER [illegible] ISSUE


10
9
8
7
2
3
4
5
6
7
8
1
14
13
15
15
12
15
15
15
15
15
15
15
#8-32 x .500 BH
#8 LOCKWASHER
#8 FLATWASHER
5 PLACES
31
10
DETAIL A
A
A
30
PLASTIC FLAT CABLE
CLAMP - SELF-ADHESIVE
(SEE NOTE 1)
11
9
9
12
#6-32 x .562 BH. SCR.
#6 FIBER WASHER
(PLACES LABELED "B")
B
B
B
B
A
A
A
A
16
#6-32 x .437 BH SCR.
#6 LOCKWASHER
#6 FLATWASHER
(PLACES LABELED "A")
11
10
8
7

REVISIONS		
NO.	DESCRIPTION	DATE
0	[illegible]	9 2
1	HDWR CHNGS E/C 12 (369)	1-13-[illegible]
2	ADD [illegible] 2,23,29	2-6 [illegible]
3	P/L CHANGE E/C 25 (580)	5-25-78 RJL
4	RE ROUTE ITEM [illegible]	6-26-78 RJL
5	ADD PLASTIC CABLE [illegible] P4 CABLE E/C 31 (705)	7-10-78 RJL
6	ADDED ITEM 31 E/C [illegible]	11-7-78 RJL
7	P/L CHNG E/C 42 (951)	3-28-79 RJL
8	P/L CHNG E/C 57 [illegible]	5-[illegible]-79 RJL

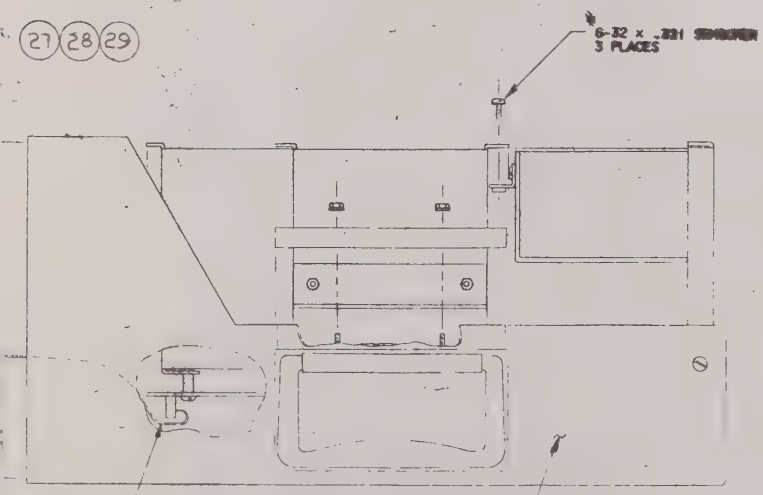
AIL A

6-32 KEPNUT
8 PLACES



10-32 KEPNUT
4 PLACES

SECTION A-A

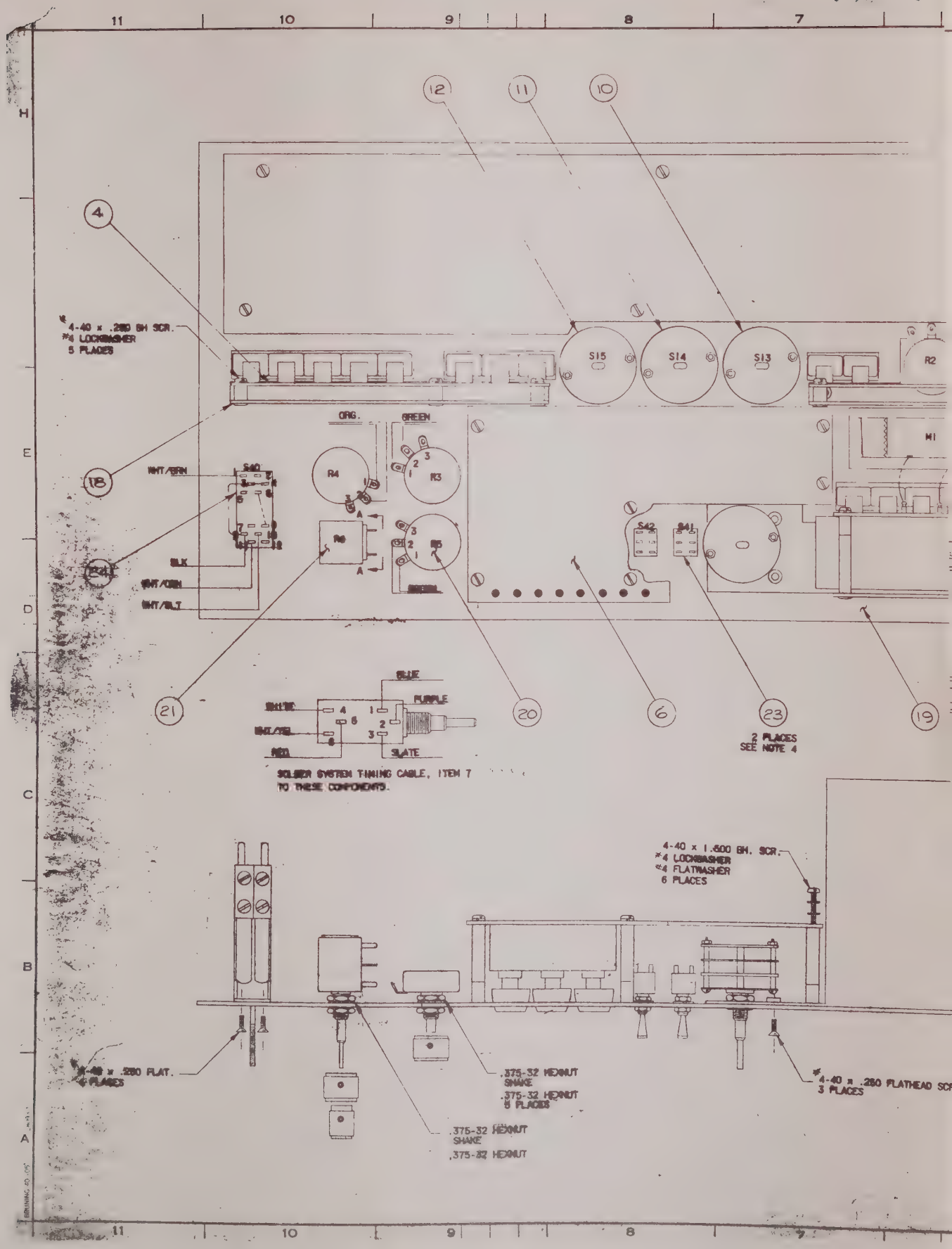


1. LOCATED ON BOTTOM OF HOUSE [illegible] TO KEEP FLAT CABLE [illegible] WRAP P/RS

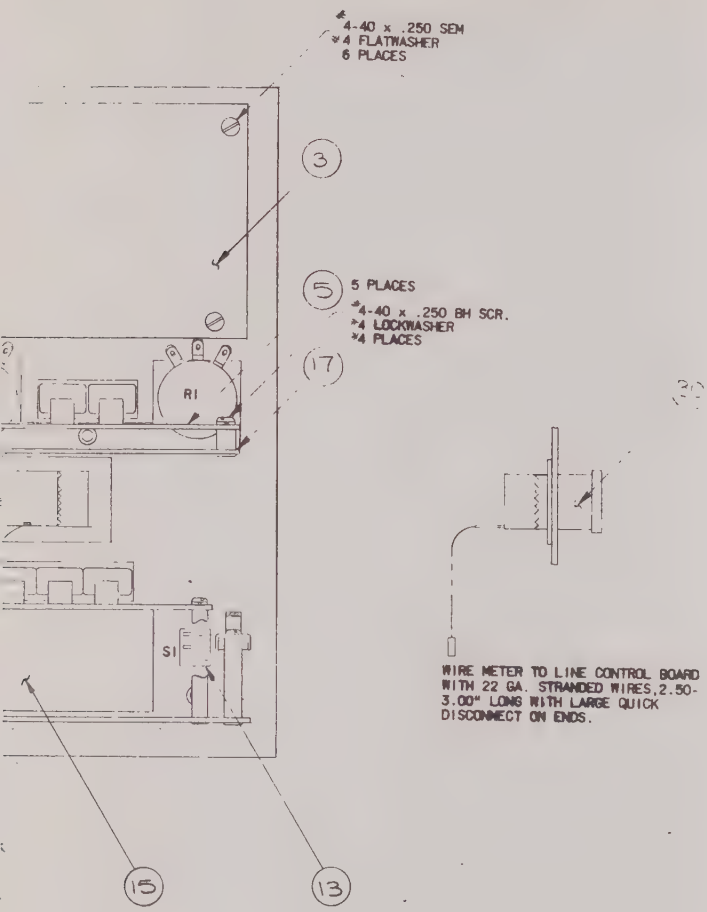
NOTES

REPAIR

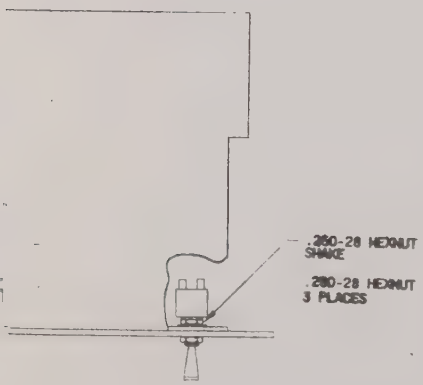
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: OVERALL ASSEMBLY MODEL 41-3A	NORTHEAST ELECTRONICS
ALL TOLERANCES ARE ± .015		
ALL BENDS ARE 90° ± ½°		
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS 1/64 RAD MAT'L .125, 1/32 RAD	FINISH — ETCH AND IRIDITE; PAINT — FEDERAL SPEC. STD COLOR [illegible]; R AND S HEAD [illegible]	MATERIAL: ALUMINUM 6061-H24 5052-H34
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	SCREEN PER	DRAWN J. F. CHECKED RJL APPROVED RJL
		SIZE D NUMBER 0041-13-[illegible]


12
11
10
4
4-40 x .250 BH SCR.
#4 LOCKWASHER
5 PLACES
S15
S14
S13
R2
ORG.
GREEN
M1
18
WHT/BRN
S40
R4
R3
24
R6
R5
BLK
WHT/ORN
WHT/BLU
S42
S41
21
20
6
23
19
BLUE
PURPLE
SLATE
2 PLACES
SEE NOTE 4
SOLDER SYSTEM TIMING CABLE, ITEM 7
TO THESE COMPONENTS.
4-40 x 1.500 BH. SCR.
#4 LOCKWASHER
#4 FLATWASHER
6 PLACES
4-40 x .250 FLAT.
4 PLACES
.375-32 HEXNUT
SHAKE
.375-32 HEXNUT
5 PLACES
.375-32 HEXNUT
SHAKE
.375-32 HEXNUT
4-40 x .250 FLATHEAD SCR
3 PLACES

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9-[illegible]-78	[illegible]
1	SH 2 CHG. PER ECO 11 (188)	1-12-79	SKN
2	ADDED ITEM 7 PER ECO 12 (369)	1-13-79	SKN
3	ADDED W/EMS 3/4-32 TO SHT 2 CHNGS 12	5-1979	[illegible]
4	SHT 2 CHNG ECO 19 (420)	6/9/15	[illegible]
5	P/L CHNG ECO 42 (932)	3-2-79	RJL



WIRE METER TO LINE CONTROL BOARD WITH 22 GA. STRANDED WIRES, 2.50-3.00" LONG WITH LARGE QUICK DISCONNECT ON ENDS.



4. CONNECT S41 & 42 TO KEYPAD LUGS PER TABLE

WIRE COLOR	LUG №
ORANGE	B
GREEN	D
BLUE	B
YELLOW	E
RED	C
BLACK	A
PURPLE	K
SLATE	H

REPAIR

3. ALL LOCKWASHERS ON POTS & SWITCHES GO ON REAR SIDE OF PANEL (17 PLACES) OCT 22 1979

2. WIRE S41,42 PER REFERENCE DRAWING № 0041-13-027 AND 0081-13-028.

1. S1,41,42 MOUNT WITH KEYWAY DOWN.

NOTES

SHEET	1	2
REV	5	4

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MATL .09 OR LESS 1/64 RAD MATL .125, 1/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE: FRONT PANEL ASSEMBLY

FINISH — ETCH AND ANODIZE
PAINT — FEDERAL SPEC. STD. COLOR 36-173
S AND S VINYL 0000-1484

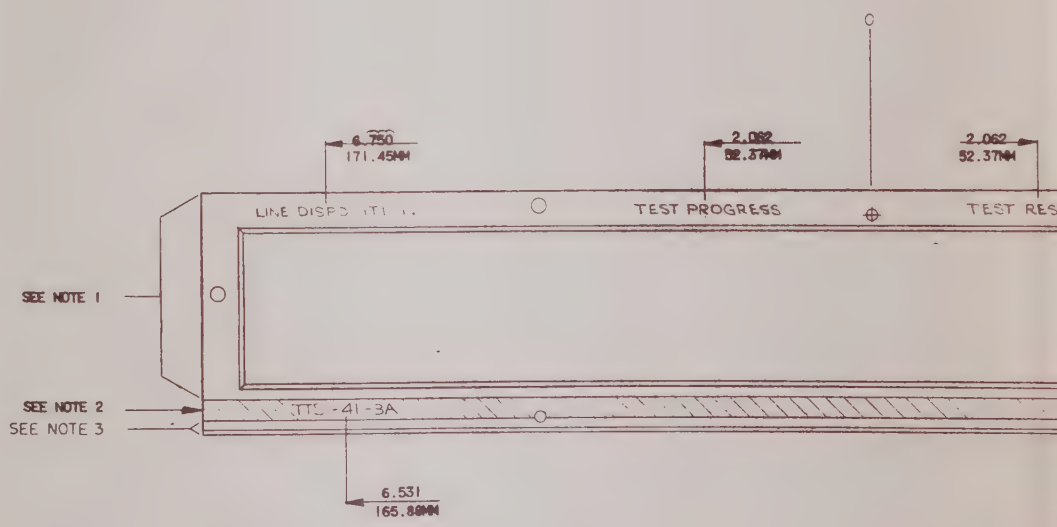
MATERIAL: ALUMINUM 5052-H34 .125-H34

SCREEN PER

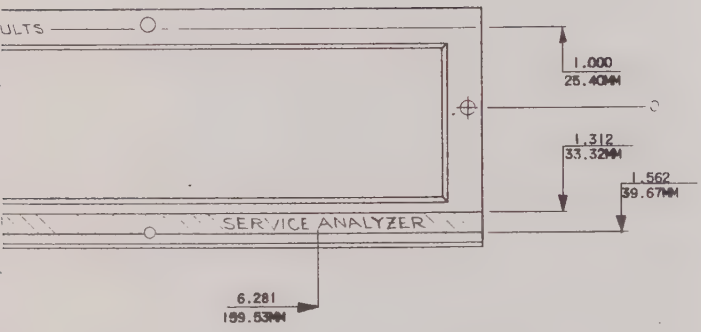
NORTHEAST ELECTRONICS INC

DRAWN [illegible] DATE 7/8/[illegible] SCALE
CHECKED [illegible] DATE 7/[illegible]
APPROVED SKN DATE 7/[illegible]

SIZE D NUMBER 0041-13-045


6.750
171.45MM
2.062
52.37MM
2.062
52.37MM
LINE DISPL
TEST PROGRESS
TEST RES
SEE NOTE 1
SEE NOTE 2
SEE NOTE 3
TTS-41-3A
6.531
165.88MM

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
0		9-22-77	SKN



7. SCREEN SHOE SHOWN, NOTE CHANGE.

6. ALL DIMENSIONS IN [illegible] ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

5. DIMENSIONS INDICATE CENTER OF TITLES.

4. BURNT ORANGE-CANADC SB-119-OR EQUIVELENT.

3. THIS AREA TO BE BLACK MATTE FINISH.

2. CROSSHATCH AREA TO BE BURNT ORANGE. LETTERING IS BLACK 14PT FUTURA.

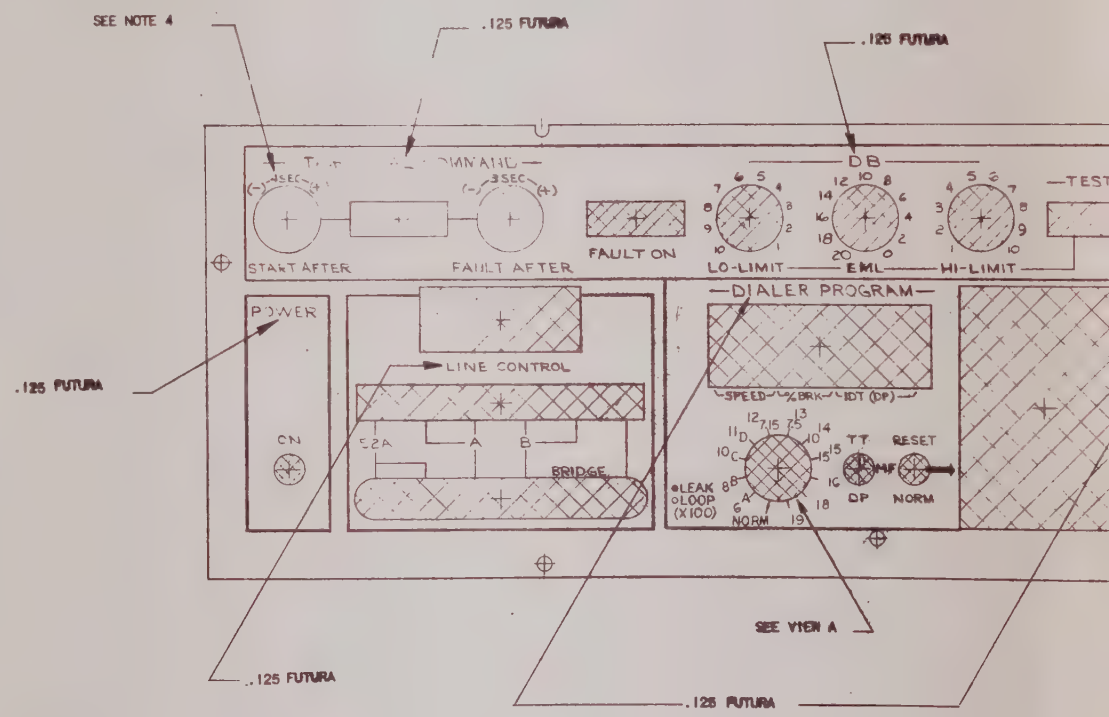
1. THIS AREA TO BE BLACK MATTE FINISH. LETTERING TO BE BURNT ORANGE, 12PT FUTURA.

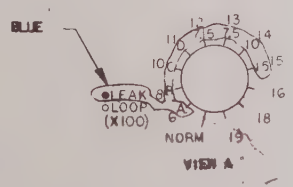
OCT 22 1979

NOTES

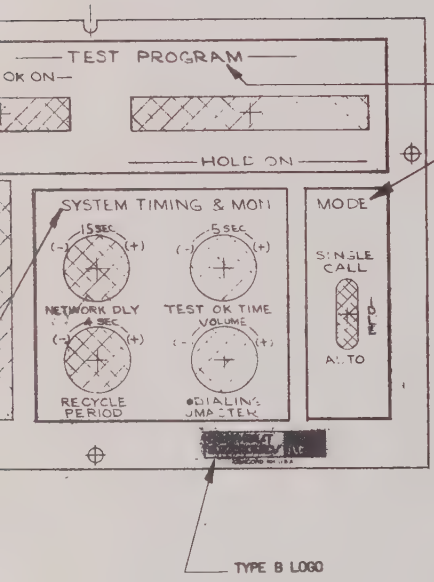
REPAIR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: DISPLAY BEZEL SILKSCREEN	NORTHEAST ELECTRONICS
ALL TOLERANCES ARE ± .010		
ALL BENDS ARE 90° ± ½°		
BEND RADIUS AS FOLLOWS: MATL .09 OR LESS, 1/64 RAD; MATL .125, 1/32 RAD	MATERIAL: ALUMINUM 5052-H34, 3003-H14	DRAWN [illegible] DATE 3/4/77 SCALE
BREAK ALL SHARP EDGES; DEBUR ALL HOLES; SAND ALL SURFACES WITH FINE GRIT	PAINT — FEDERAL SPEC. 595 COLOR [illegible]	CHECKED [illegible] DATE
	[illegible] AND PANTONE 485 WIN	APPROVED DATE
	SCREEN PER [illegible]	SIZE D NUMBER 0041-13-003


SEE NOTE 4
.125 FUTURA
.125 FUTURA
DB
TEST
START AFTER
FAULT AFTER
FAULT ON
LO-LIMIT
EML
HI-LIMIT
DIALER PROGRAM
POWER
ON
LINE CONTROL
S2A
A
B
BRIDGE
SPEED
%BRK
IDT (DP)
TT
RESET
MF
DP
NORM
LEAK
LOOP
(X100)
NORM
.125 FUTURA
SEE VIEW A
.125 FUTURA
.125 FUTURA


BLUE
LEAK
LOOP
(X100)
NORM
VIEW A

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9-[illegible]-77	[illegible]



7. COMPLETED PANEL TO HAVE NON-GLARE FINISH.

6. AREAS WITH [illegible] ARE PUNCHED HOLES. POSITIONING AND CENTERING OF ALL INFO TO BE REFERENCED TO HOLES AND SLOTS ON DWG D0041-13-100.

5. ALL LETTERS TO BE .085" FUTURA UNLESS OTHERWISE SPECIFIED.

4. NUMBER TO BE APPROX. .086. SMALL CASE LETTERS TO BE APPROX. .050. LEGEND TO BE ON 1/2" RADIUS. ALL (+) AND (-) SYMBOLS INDEXED 45° FROM VERTICAL CENTER. TYP. 6 PLACES.

3. "LO-LIMIT", "ENG", "HI-LIMIT", NUMERALS ON 30° INDEXING. "LINE LEAK", "LOOP RES" NUMERALS ON 30° INDEXING.

2. ALL LINES BOXING IN AREAS TO BE .061 WIDE. ALL OTHERS TO BE .015 WIDE.

1. ALL LINE WORK AND CHARACTERS TO BE BLACK EXCEPT LEAK VALVES TO BE BLUE.

NOTES

REPAIR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: FRONT PANEL SILKSCREEN	NORTHEAST ELECTRONICS	
ALL TOLERANCES ARE ± .010		[illegible] ME, U.S.A.	
ALL BENDS ARE 90° ± ½°	FINISH: [illegible]	MATERIAL: ALUMINUM 5052 H34 3003 H14	DRAWN [illegible] DATE [illegible] SCALE
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD	COLOR: GLARE		CHECKED DATE
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	SCREEN PER DETAIL D0041-13-100		APPROVED DATE
			SIZE D NUMBER 0041-13-00

11
10
9
1
2
3
5
7
8

SEE NOTE 1

OCT 22 1979

ALL IMAGES ON THIS SHEET SHEET 2
TO BE WHITE IN COLOR.

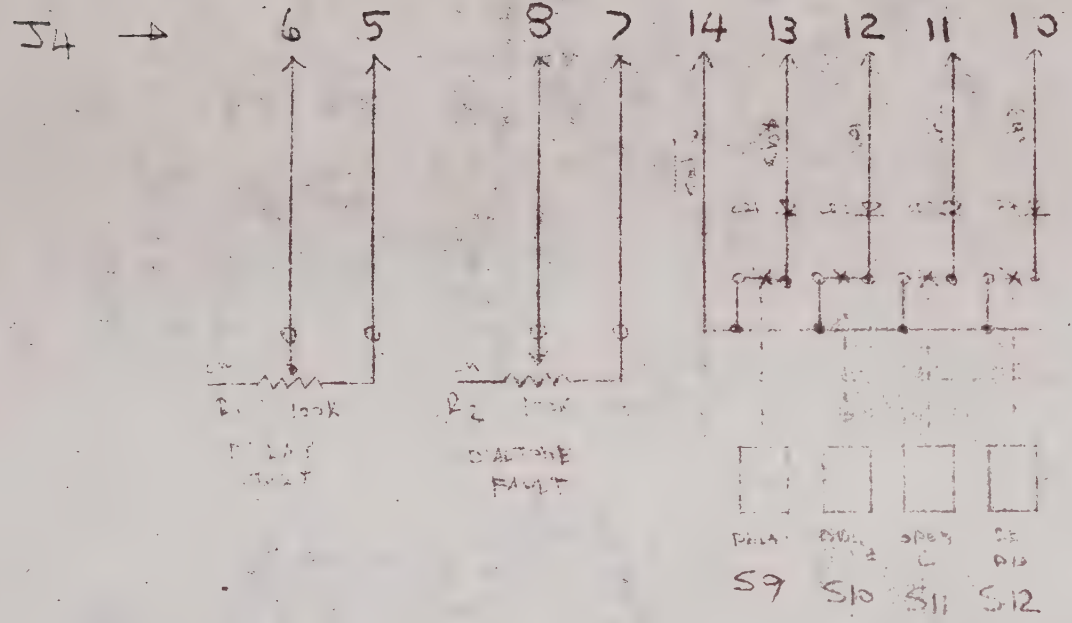
REPAIR

OPERATING INSTRUCTION [illegible] DWG

[illegible]

CCL-3-C06

0	ORIGINAL ISSUE		



OCT 22 1979

REPAIR

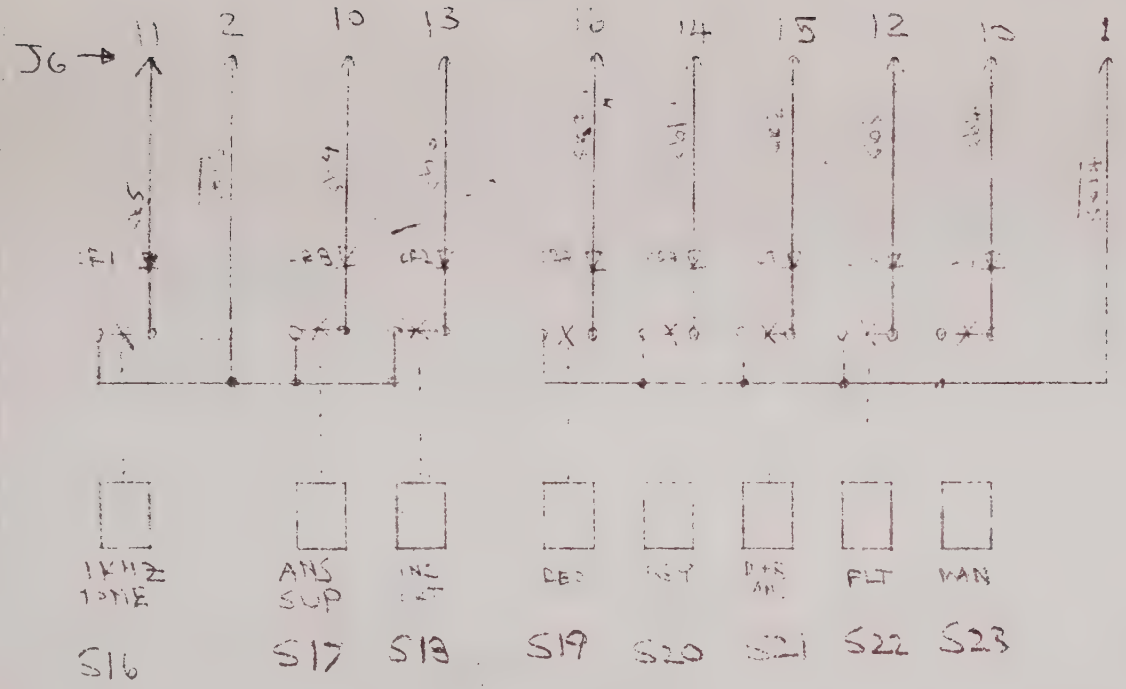
PROGRAMMER I

A-2241-13-313

9-22-77 GKN

REV 0

0	ORIGINAL ISSUE	9-22-79	SKN



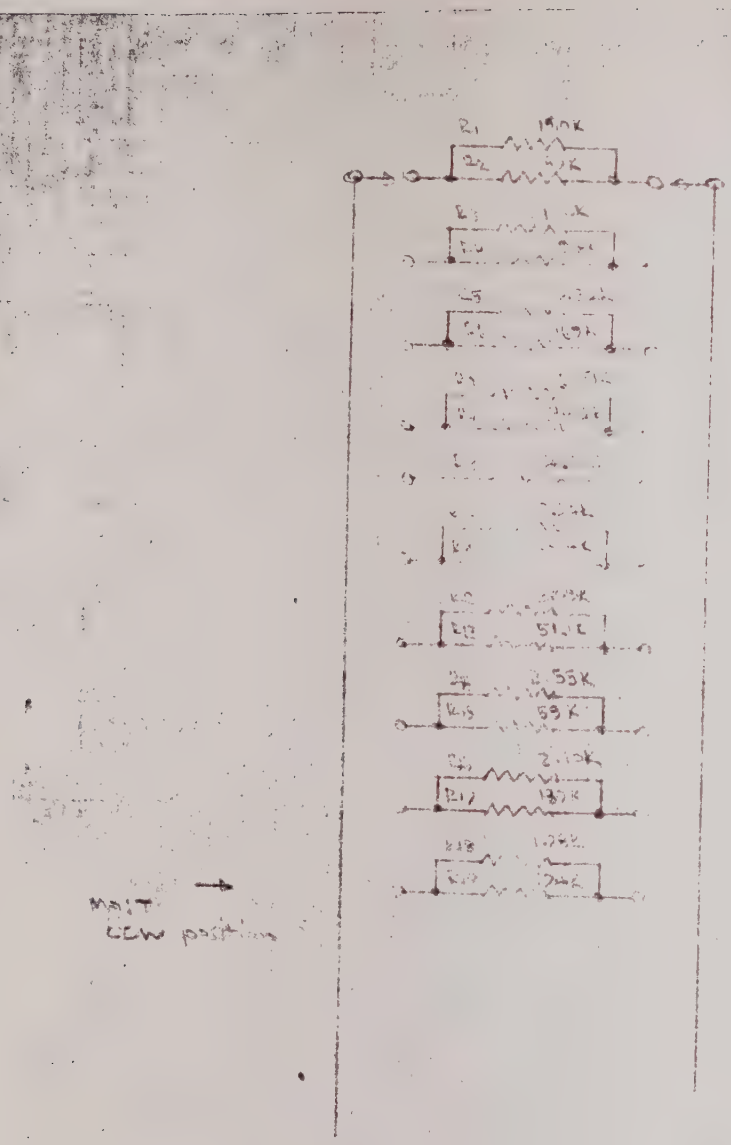
OCT 22 1979

REPAIR

PROGRAMMER II

A-0241-13-312

REV
9-22-79 SKN Q



Lo Level Switch Assy

REPAIR

OCT 22 1979

A-8041-13-329

9-22-79 SKN

REV
O

0	ORIGINAL ISSUE		

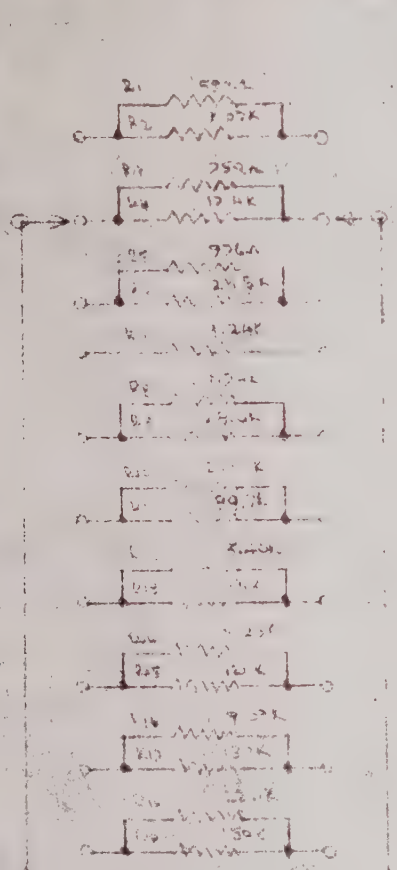
H1 LEVEL SWITCH ASSY

A-2041-13-201

REPAIR

OCT 22 1979

0	ORIGINAL ISSUE	9-22-79	SKH



EML SWITCH ASSY

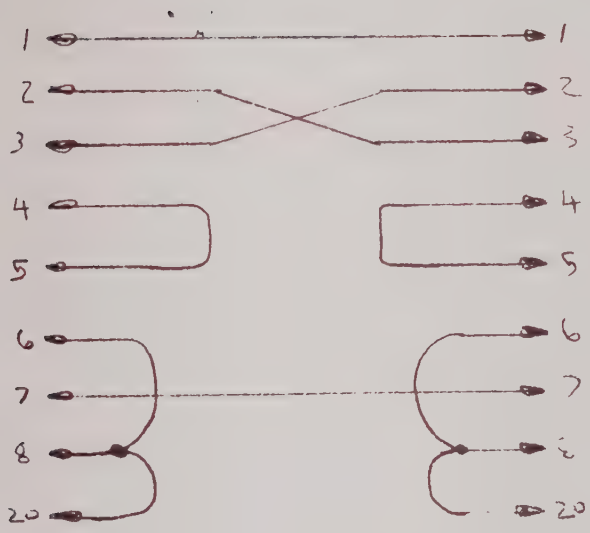
REPAIR

OCT 22 1979

A-0041-13-3

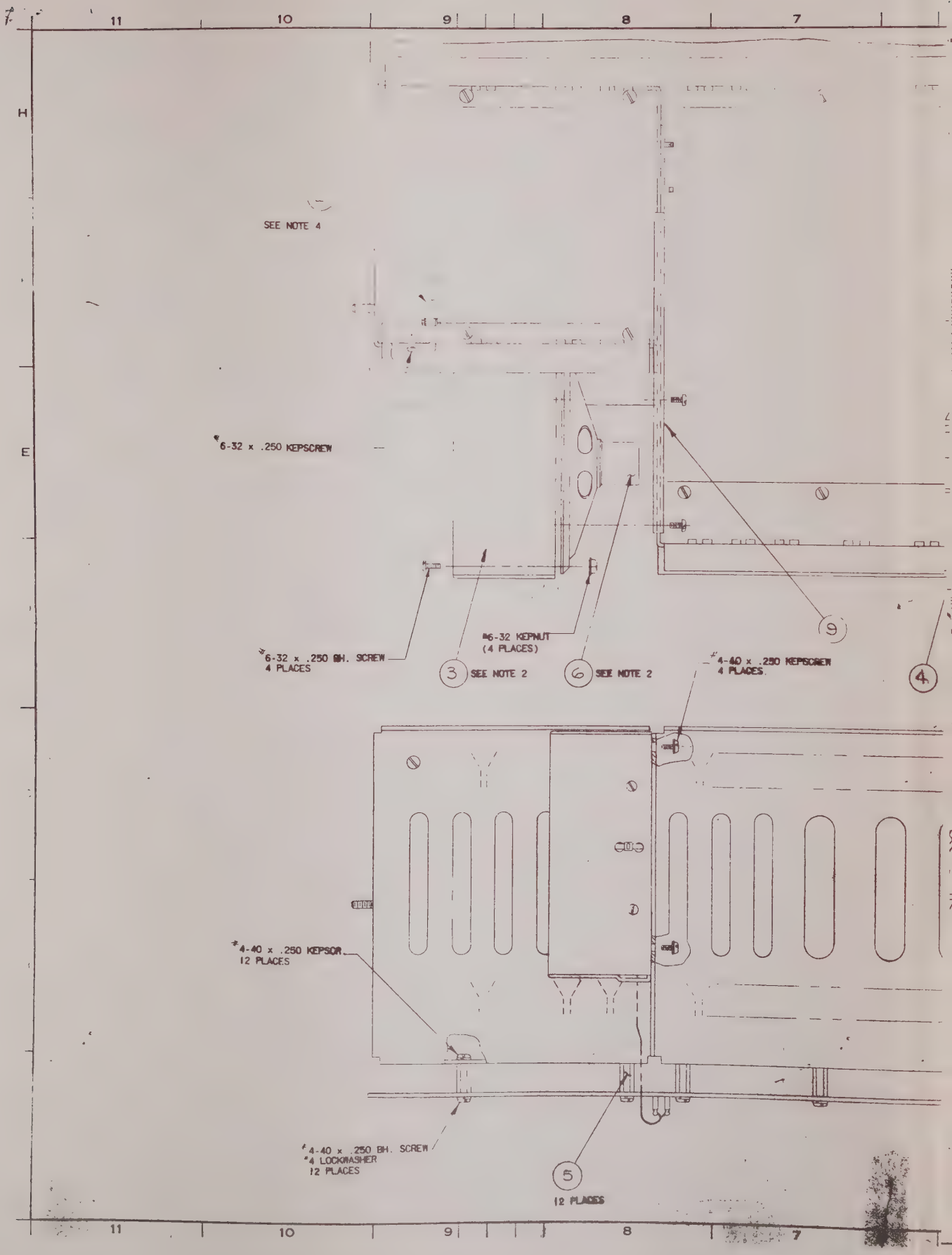
REV

0	REL 4/0 39 (799)	SKN	1-9-79

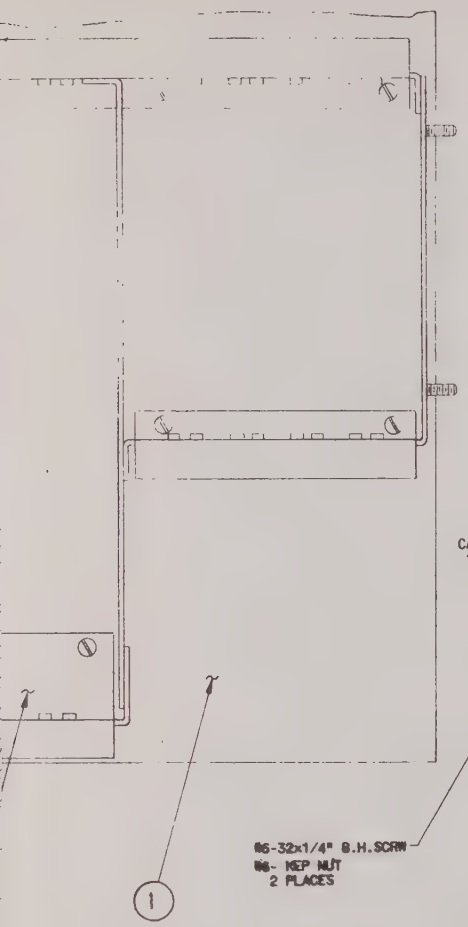


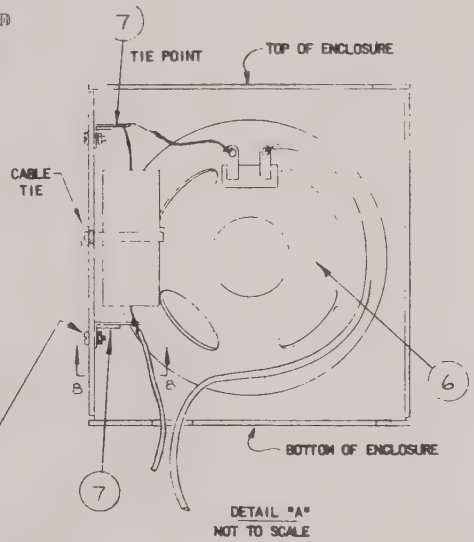
REPAIR
OCT 22 1979

TITLE: STATIC NULL MODEM CONNECTOR	NORTHEAST ELECTRONICS (Division of nt northern telecom) CONCORD, NH, U.S.A.	
DRAWN SKN	DATE 6-5-78	
CHECKED	DATE	
APPROVED SKN	DATE 9-7-7	
SIZE A	NUMBER 3041 18-7-3	ISSUE 0


11
10
9
8
7
H
E
SEE NOTE 4
#6-32 x .250 KEPSCREW
#6-32 KEPNUT
(4 PLACES)
#6-32 x .250 BH. SCREW
4 PLACES
3
SEE NOTE 2
6
SEE NOTE 2
#4-40 x .250 KEPSCREW
4 PLACES.
9
4
#4-40 x .250 KEPSCR
12 PLACES
#4-40 x .250 BH. SCREW
#4 LOCKWASHER
12 PLACES
5
12 PLACES

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9-22-7[illegible]	[illegible]
1	CHG. P.L. & A.N. ETAL. A[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]

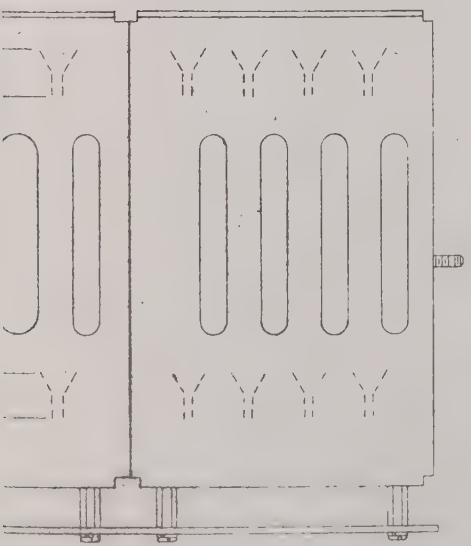


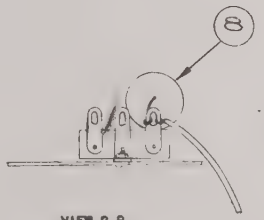


DETAIL "A"
NOT TO SCALE

#6-32x1/4" B.H.SCRW
#6- KEP NUT
2 PLACES

1





VIEW B-B

4. ATTACH ITEM 2 WIRES TO MOTHER BOARD PER TABLE.

MOTHERBOARD LUG LABEL	WIRE COLOR	SLV. HOLD MOD. LABEL
SLV	GREEN	E1
GATE	YELLOW	E3
-12	BLUE	E2
GND	BLACK	E4

3. SOLDER LOOSE ENDS OF SPEAKER WIRES TO Q.D. ON BOTTOM OF MOTHER BOARD (Q.D. DESIGNATION SPKR.1 SPKR.2)

2. SEE DETAIL "A"

1. ATTACH 22 GAUGE WIRES (8" LONG) TO SPEAKER TERMINAL AND TIE POINT, SLEEVE WIRES USING #9 CLEAR TUBING.

OCT 22 1979

REPAIR

NOTES

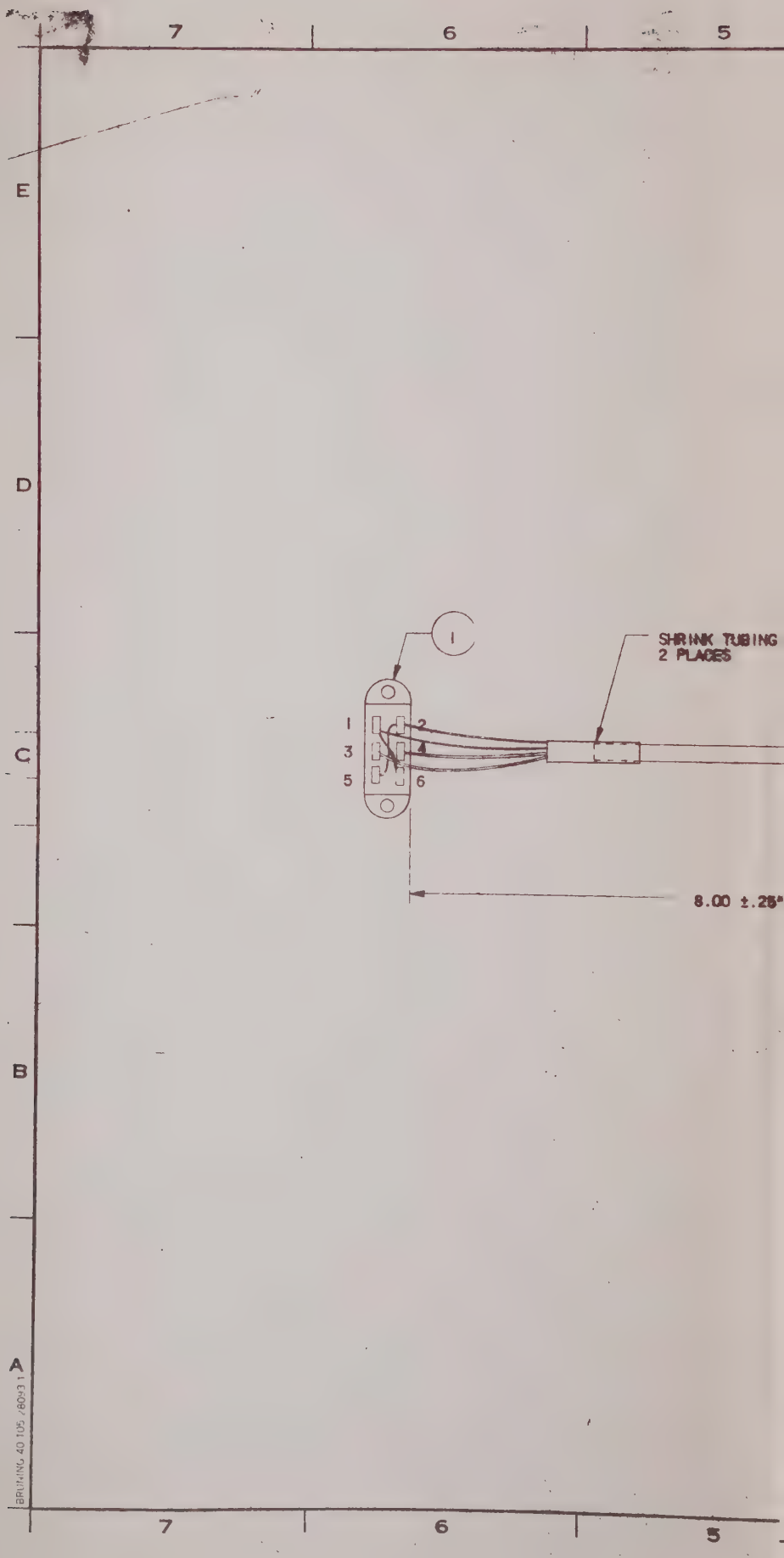
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS 1/64 RAD MAT'L .125 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE
CARD CAGE ASSEMBLY

FINISH — ETCH AND IRIDITE
PAINT — FEDERAL SPEC. 595 COLOR 26490
~~B AND S VINYL 8000 WHT~~
MATERIAL
~~ALUMINUM 5052-H34 5005-H14~~
GASKET PER

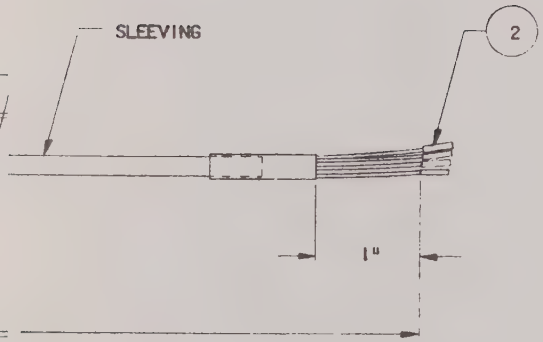
NORTHEAST ELECTRONICS
HAMPSHIRE U.S.A.

DRAWN [illegible] DATE
CHECKED [illegible] DATE
APPROVED [illegible] DATE
SCALE
SIZE D NUMBER [illegible] ISSUE


7
6
5
E
D
C
B
A
1
SHRINK TUBING
2 PLACES
1
2
3
5
6
8.00 ±.25"
BRUNING 40 105 / 80-93 1

WIRE LIST			
COLOR	SWITCH FROM	LUG ON PCB TO	LENGTH
YEL	S8-1	—	8.50"
SLT	S8-2	—	↓
RED	S8-3	—	↓
ORG	S8-4	—	8.50"
WHT	S8-1	S8-6	1.00"
WHT	S8-2	S8-5	1.00"

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	CHNG ITEM 2 ON PL %3(309	10-11-77	SKN



OCT 22 1979

REPAIR

NOTES

1. WIRE TO BE 22 GA. STRANDED.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .128, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE: SWITCH ASSY S-8

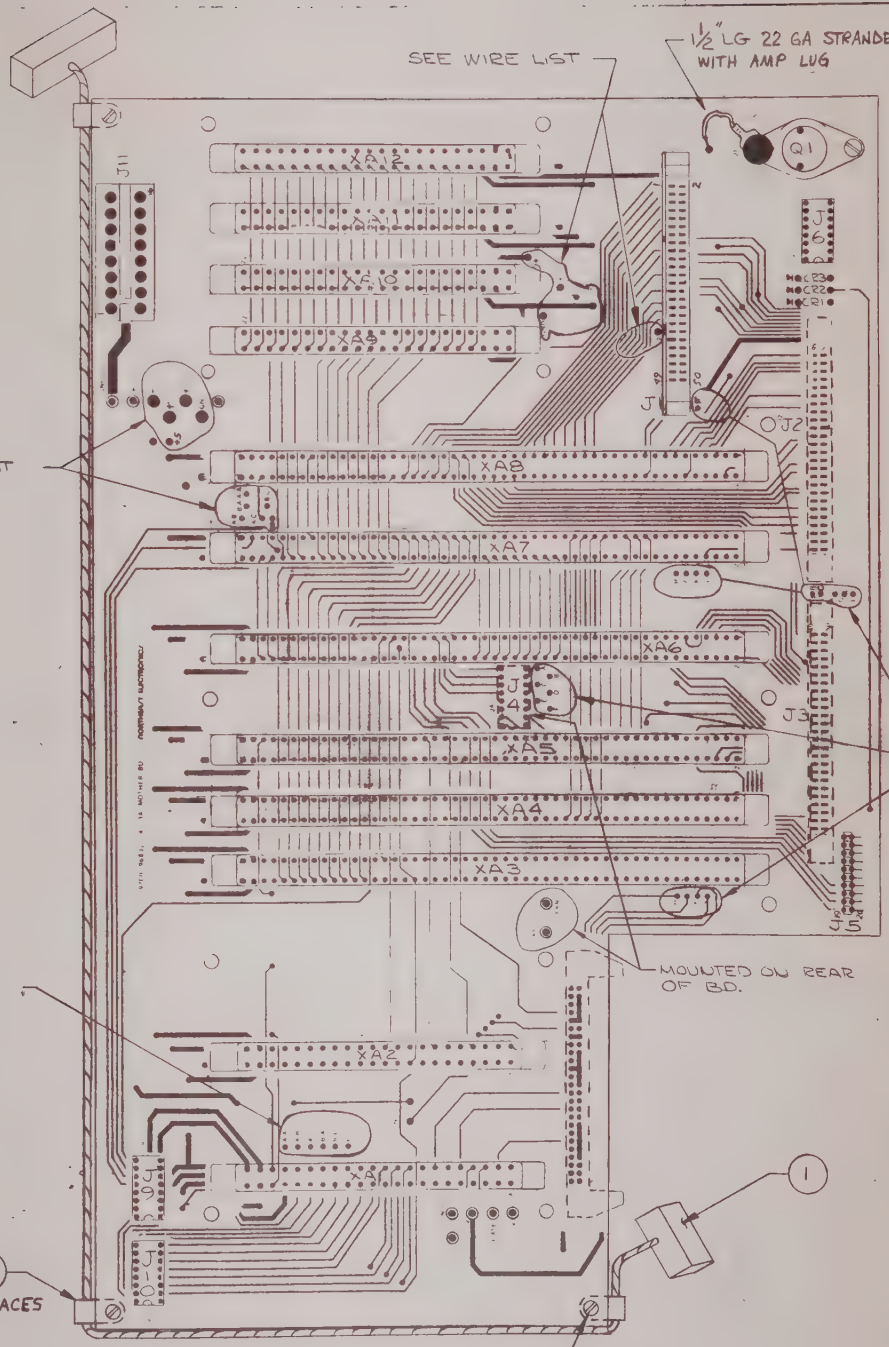
FINISH — ETCH AND IRIDITE
PAINT — FEDERAL SPEC. 595 COLOR 26492
R AND S VINYL 8050 WRH
SCREEN PER

MATERIAL: ALUMINUM 5052-H34 3003 H14

NORTHEAST ELECTRONICS INT
CONCORD NEW HAMPSHIRE

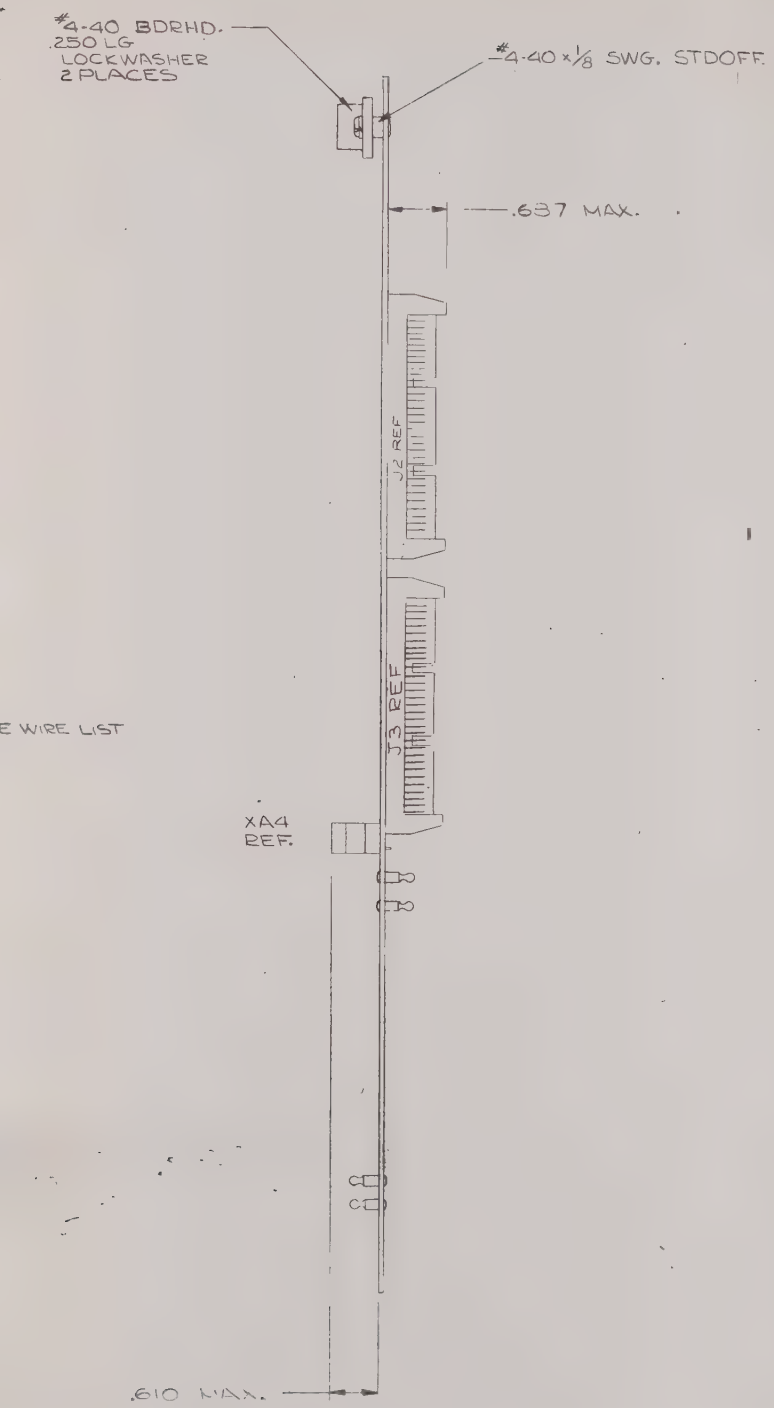
DRAWN — DATE 9-22-77 — SCALE
CHECKED SKN — DATE 9-10-77
APPROVED SKN — DATE 9-10-77

SIZE C — NUMBER 0041-13-059 — ISSUE 1



WIRE LIST			
NO	FROM	WIRE GA.	TO
1	A	22 GA	A
2	B	22 GA	B
3	C	22 GA	C
4	D	22GA	D
5	E	22GA	E
6	F	22GA	F
7	H	22GA	H
8	J	22GA	J
9	K	22GA	K
10	L	22GA	L
11	A-A	22GA	A-A
12	A-B	22 GA	A-B
13	A-C	22 GA	A-C
14	B-A	22GA	B A
15	B-B	22 GA	B-B
16	B-C	22 GA	B-C
17	+12	18 GA	+12
18	12	18 GA	12
19	+5	18 GA	+5XA10
20	GND	18 GA	GND
21	+5	18GA	+5ATJ1

ALL WIRES TO BE W-ITE.
ALL WIRES ARE TO BE LAYED OUT ON FRONT OF BOARD. (SIDE SHOWN)



E WIRE LIST

REVISIONS			
N	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	CHNG STRAP REF C/O 4 298	10-31-77	SKN
2	CHNG J2 STYLE 5621 (905)	6-26-78	RJL
3	CHG PER 5/063 (909)	8-16-79	JJ L.

OCT 22 1979

REPAIR

1. ● DENOTES LARGE MALE QUICK DISCONNECT

NOTES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: .015

TITLE: 41-3A MOTHER BD. ASS'Y 96831

MATERIAL

FINISH — ETCH AND IRIDITE
PAINT — FEDERAL SPEC 595 COLOR TAN
2 AND 5 VINYL SOLID WIRE

ALUMINUM 5052 H32 .062 THICK

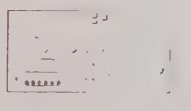
SCALE FULL

NORTHEAST ELECTRONICS INC

DRAWN [illegible] DATE 9-22-77
CHECKED [illegible] DATE 9-22-77
APPROVED SKN DATE 9-22-77

SIZE D NUMBER 004113-011

CONNECTIONS AND LINE CONTROLS



1. To combine, call registration tones to analyzer:
   a. Connect tip of 4-conductor test plug to **METERED CIRCUIT SELECTOR** jacks. Ensure all 4 pairs are between channel A and channel B.

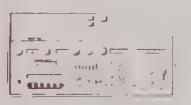
   OR

   b. Connect conductors of 4-conductor test cord from front panel channel A and B jacks to appropriate pairs of customer's local loop.
   c. Do not connect this 4-lead cord to PBX interface.

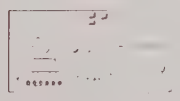
2. Dial service call (or simply connect) to the unit-under-test and use the rear panel **INCOMING CIRCUIT** terminal.

3. Press **TEST A** and/or **TEST B** to dial on channel A and/or channel B as desired. One or both **TEST** pushbuttons must be engaged to avoid a program error condition.

4. Release all other **LINE CONTROL** pushbuttons.

POWER ON

1. Set **MODE** switch to **IDLE**.
2. Set **POWER** switch to **ON**.
3. Press **RESET** pushbutton.

TEST PROGRAM



1. Select supervision faults to be detected by pressing desired **FAULT ON** pushbuttons: **OPEN C-LEAD** and/or **REVERSAL DURING DIALING**.

2. To **TEST OK** on receipt of 1 kHz tone:
   a. Press **TONE TEST**.
   b. Set **LVL** control to expected measurement level.
   c. Set **HI-LIMIT** and **LO-LIMIT** controls to allowed deviation from the expected level.

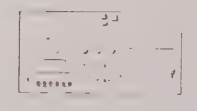
3. To **TEST OK** on answer supervision, press **ANS SUP**.

4. To **TEST OK** on call completion by hook [illegible] **INCOMING CKT**.

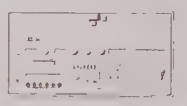
5. To avoid a program error condition, one or more **TEST OK** pushbuttons must be engaged.

6. To condition the unit to stop operation and hold the [illegible] under test when a fault, such as reversal, is initially detected, press the desired **HOLD ON** pushbuttons.

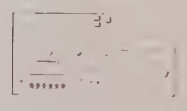
SYSTEM TIMING



1. Select the maximum time allowed for detection of **TEST OK** tone and **NETWORK DELAY** control.
2. Set the minimum time silence (dead) test results must be present before **TEST OK** can be recorded with the **TEST OK TIME** control.
3. Set the desired on-hook time between test calls with the **RECYCLE PERIOD** control.
4. Set **DIALING** and **MASTER VOLUME** controls to midrange.

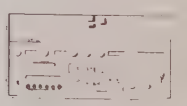
START DIAL PROGRAM

1. Prevent dialing after a preset time interval:
   a. Press **DELAY**.
   b. Set start dial delay with **START AFTER** control.
2. To begin dialing after dial tone (or wink on units with ATI option) is received:
   a. Press **DIAL TONE**.
   b. Set **DIALTT AFTER** control to maximum time allowed for detection of dial tone or wink.
3. If both **DELAY** and **DIAL TONE** are pressed:
   a. Unit begins dialing when dial tone or wink is received after initial off-hook.
   b. If **WAIT** command is later entered into dialer, dialing resumes after start dial **DELAY** expires.
4. To avoid a program error condition, at least one of the above described start dial programs must be selected.
5. The **PROGRAM ERROR** message should not be displayed at this time.

DIALER PROGRAM



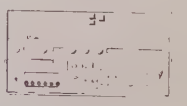
1. Set **RESET NORM** switch to **RESET**, then to center (load) position.
2. Enter number to be dialed via keyboard:
   a. Insert a wait for start dial (**WSD**) as desired.
   b. After number is entered, press end of number (**END**) key.
3. Set **RESET NORM** switch to **NORM**.
4. Select 1-touch tone (**TT**), dial pulse (**DP**) or **MF** tone/wait dialing as desired via **TT DP MF** switch.
5. Select desired **LOOP** resistance (outer knob) and **LEAK** impedance (inner knob) with rotary switch.
6. Use **DIALER PROGRAM** thumbwheel switch to:
   a. Set dial **SPEED** in pps (**DP** mode) or in digits per second (**TT** or **MF** mode).
   b. Set **% BRK** (**DP** mode) or percent tone (**TT** or **MF** mode).
   c. Set interdigit time (**IDT**) in milliseconds (with if in **DP** mode).

BEGIN TESTS



1. Use **SINGLE CALL** mode to check installation and programming.
2. Enter the **AUTO** mode to begin multiple call testing.
3. Set speaker volume during dialing with the **DIALING VOLUME** control (inner knob). Set volume during other periods with **MASTER VOLUME** control (outer knob).

TEST RESULTS



1. Press **TEST RESULTS** pushbuttons at any time for accumulated test results.
2. **LINE DISPOSITION** and **TEST PROGRESS** display sections of front panel indicate the status of current call.
3. If desired, enter the **IDLE** mode and press **RESET** to clear accumulated test results to zero.
4. Refer to instruction manual for more detailed operating instructions.

OPERATING INSTRUCTIONS

NORTHEAST ELECTRONICS | nt | Instruments Corporation
Airport Rd., P.O. Box 649, Concord, N.H., 03301

INSTRUCTIONS

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
W1	ORIGINAL ISSUE	2-6-78	
0	RELEASED TO PROD C/115(925)	5-1978	YBM

3. NORTHEAST ELECTRONICS HAS MASTER ARTWORKS, NEGITIVES, AND POSITIVES. THESE ITEMS ARE AVAILABLE FROM THE NORTHEAST DOCUMENTATION DEPARTMENT, CONCORD, N.H.

2. ALL IMAGES ON THIS SHEET, SHEET 1, TO BE BLACK IN COLOR, ON A GRAY BACKGROUND.

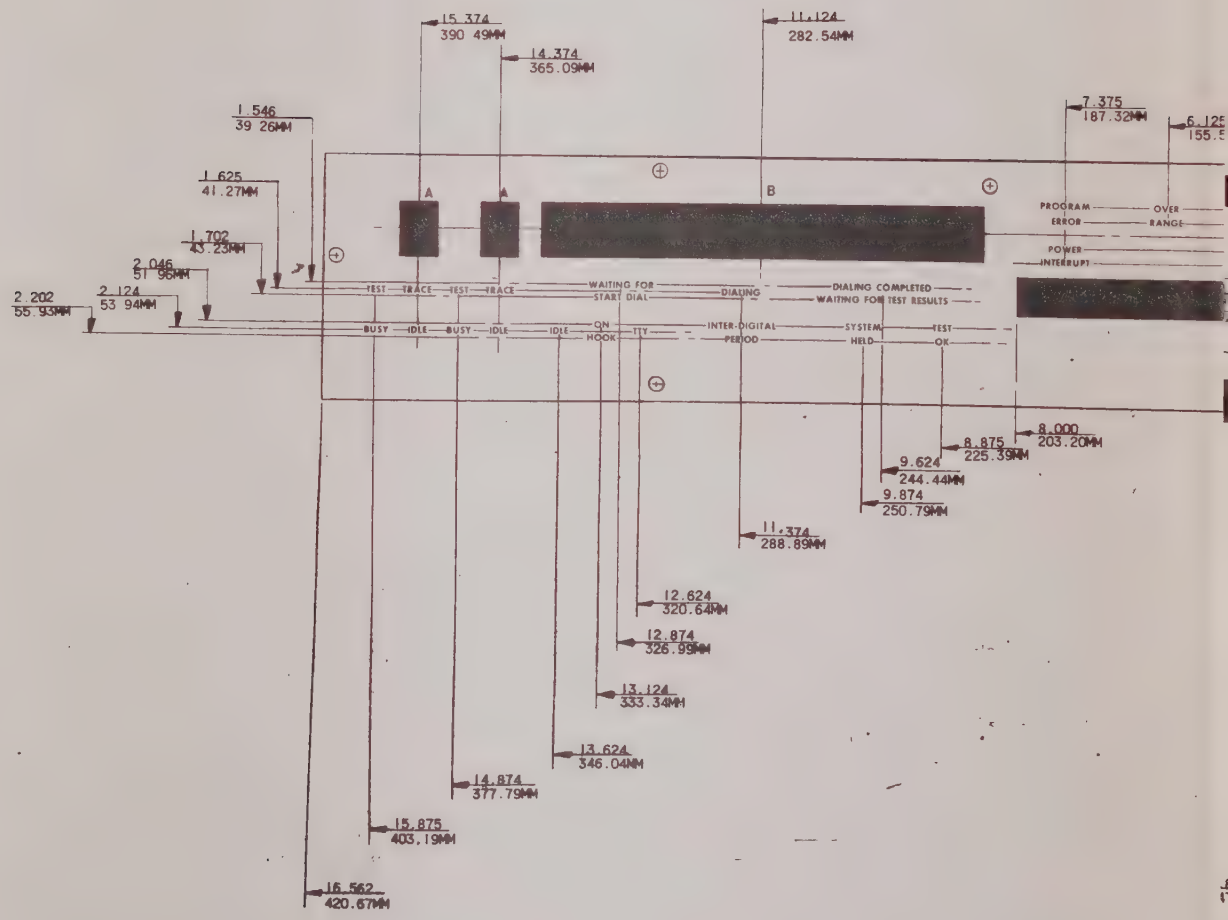
1. MATERIAL: DURANYL OVERLAYS @ 4.625 X 14.500 X .030 THICK TO BE PRINTED GRAY AND BLACK ON 2110 WHITE BACKGROUND, FALMOUTH FINISH, ONE FOLD AND FINISHED, DIE CUT, TO SIZE.

OCT 22 1979

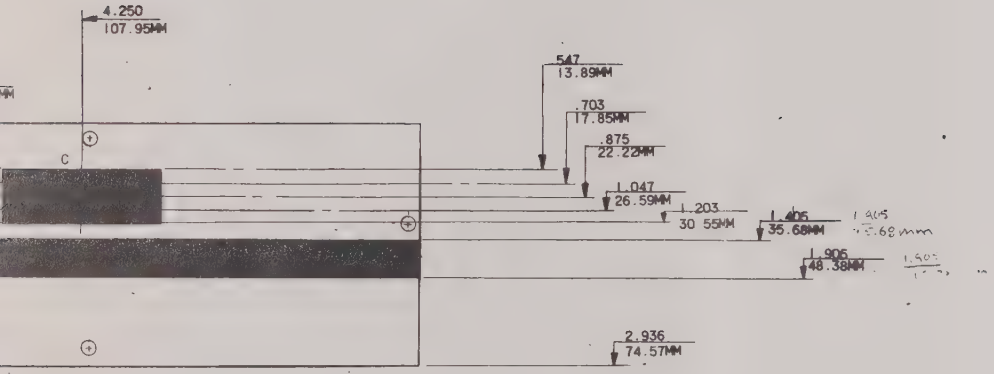
REPAIR

NOTES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE	NORTHEAST ELECTRONICS INC	SHEET 1 2
ALL TOLERANCES ARE ± .015	OPERATING INSTRUCTION SILKSCREEN DWG.		REV 0 0
ALL BENDS ARE 90° ± ½°			
BEND RADIUS AS FOLLOWS MAT'L OF .016 THICK, 1/64 RAD MAX. .125, 2-.32 RAD	FINISH — ETCH AND IRIDITE PAINT — FEDERAL SPEC. 595 COLOR 24492 R AND S-VINYL MASK, WIRE	MATERIAL ALUMINUM 5052 H34 3003 H14	DRAWN DATE 2-6-78 CHECKED DATE APPROVED DATE
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	SCREEN PER		SIZE D NUMBER 0041-12


15.374
390.49MM
14.374
365.09MM
11.124
282.54MM
7.375
187.32MM
1.546
39.26MM
1.625
41.27MM
1.702
43.23MM
2.046
51.96MM
2.124
53.94MM
2.202
55.93MM
A
A
B
PROGRAM
ERROR
OVER
RANGE
POWER
INTERRUPT
TEST
TRACE
TEST
TRACE
WAITING FOR
START DIAL
DIALING
DIALING COMPLETED
WAITING FOR TEST RESULTS
BUSY
IDLE
BUSY
IDLE
IDLE
ON
HOOK
TTY
INTER-DIGITAL
PERIOD
SYSTEM
HELD
TEST
OK
8.000
203.20MM
8.875
225.39MM
9.624
244.44MM
9.874
250.79MM
11.374
288.89MM
12.624
320.64MM
12.874
326.99MM
13.124
333.34MM
13.624
346.04MM
14.874
377.79MM
15.875
403.19MM
16.562
420.67MM

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
2.	REDRAWN PER C/O 11388	1-12-78	SKN



4. COLOR RED TO BE CANDOC KP-2024 TK-3024 OR EQUIVELANT.

3. A,B,C,D BLOCKS TO BE TRANSPARENT RED.

2. ALL LETTERING TO BE RED TRANSPARENT 10PT FUTURA DEMI BOLD.

1. ALL DIMENSIONS IN MM ARE ± .38MM UNLESS OTHERWISE SPECIFIED.

OCT 23 1979

REPAIR

NOTES

HOLE SCHEDULE			
HOLE	SIZE	NO. REQ	REMARKS
A	.687	2	
B	.250	1	
C	.2500	1	
D			
E			
F			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MATL .09 OR LESS, 1/64 RAD MATL .125 1/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE: DISPLAY PANEL SILKSCREEN

FINISH ~~ETCH AND IRIDITE~~ ~~PAINT FEDERAL SPEC. 595 COLOR 24193~~ ~~B AND S VINYL 9988 WHT~~

MATERIAL: ~~ALUMINUM 5052 H34 .062 3003 H14~~ .062 CLEAR VINYL

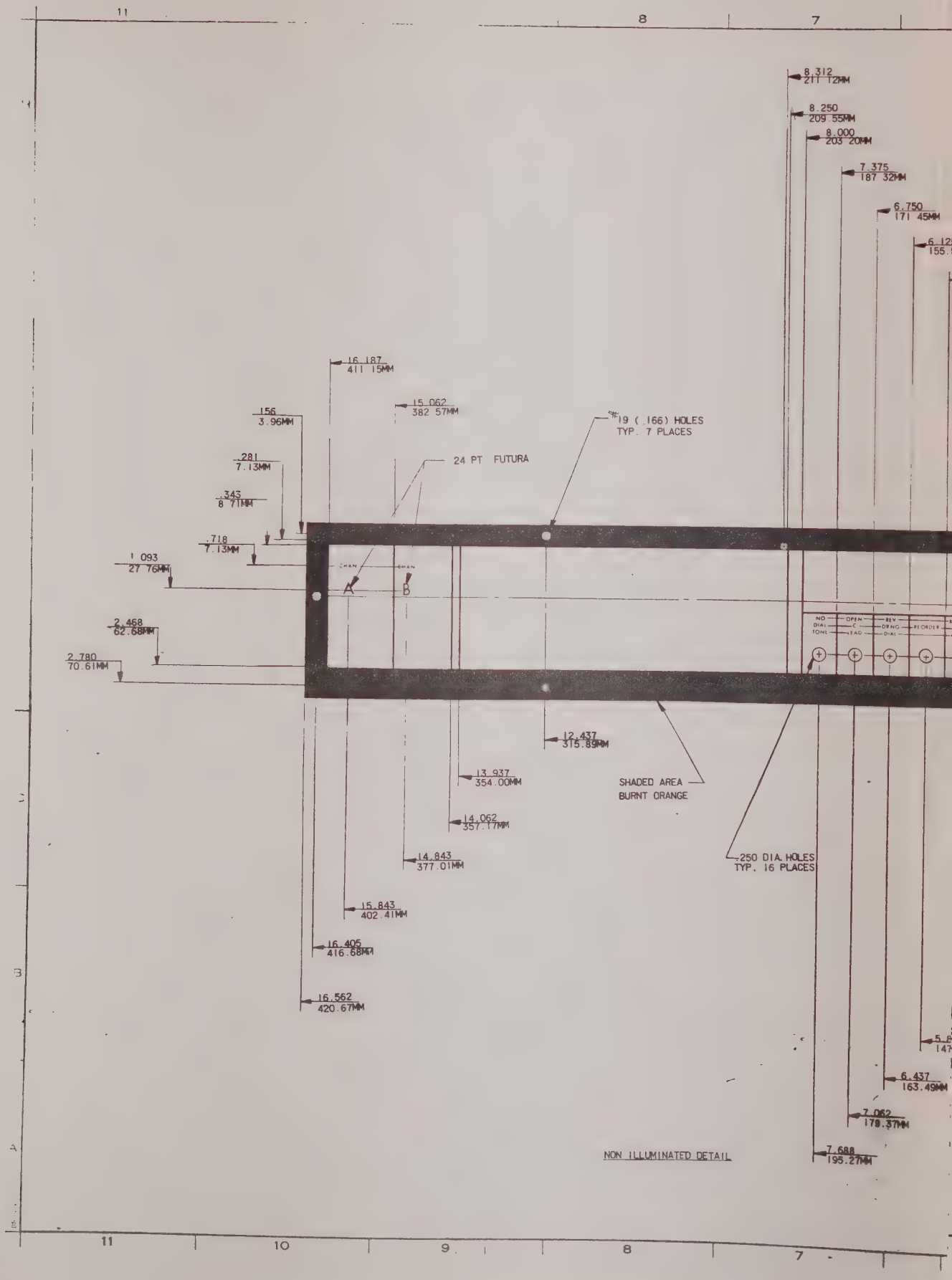
~~SCREEN PER~~

NORTHEAST ELECTRONICS nt

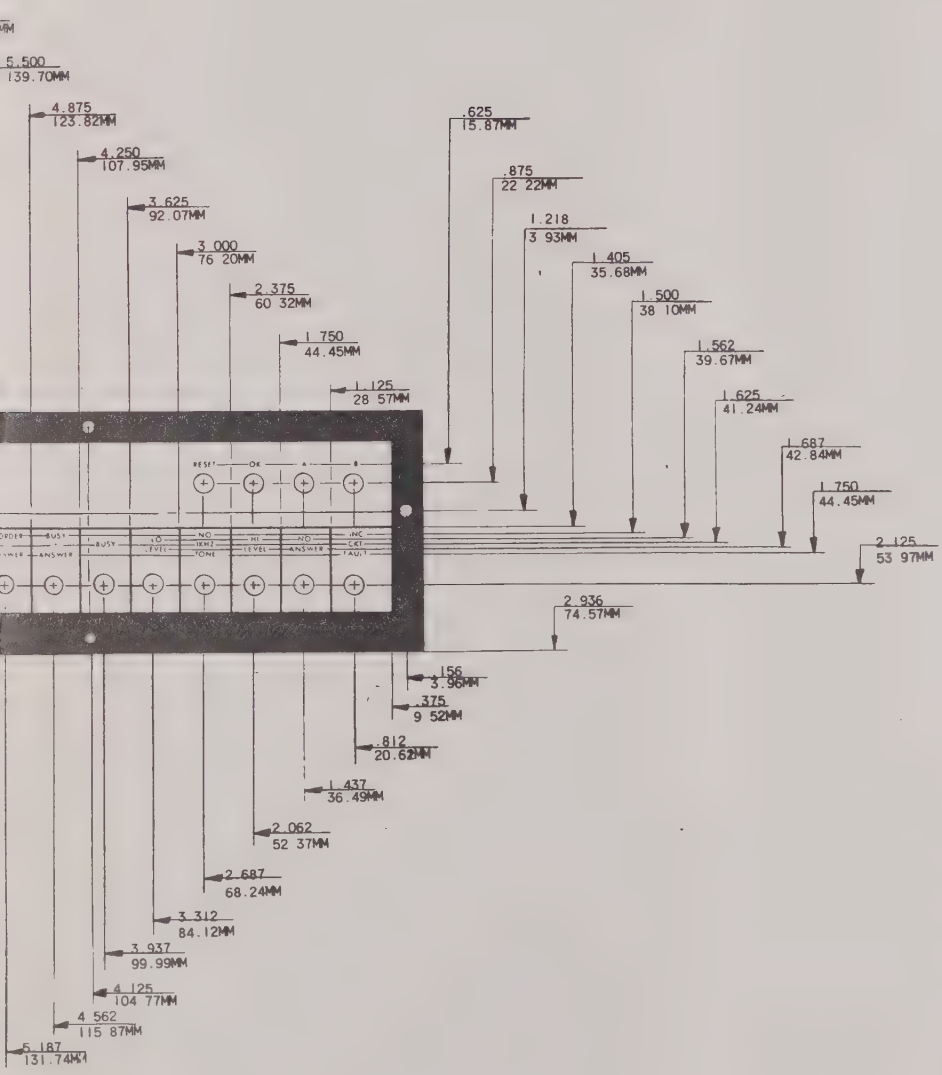
DRAWN SRG DATE 12-7-78 SCALE 1
CHECKED DATE 12-7-78
APPROVED SKN DATE 1-12-78

SIZE D NUMBER DC41-3-004 ISSUE 2

SHEET 1 2
REV 2 2


8.312
211.12MM
8.250
209.55MM
8.000
203.20MM
7.375
187.32MM
6.750
171.45MM
16.187
411.15MM
15.062
382.57MM
.156
3.96MM
.281
7.13MM
.343
8.71MM
.718
7.13MM
1.093
27.76MM
2.468
62.68MM
2.780
70.61MM
19 (.166) HOLES
TYP. 7 PLACES
24 PT FUTURA
CHAN
CHAN
A
B
NO.
DIAL
TONE
OPEN
C
LEAD
REV
DRNG
DIAL
RE ORDER
12.437
315.89MM
13.937
354.00MM
14.062
357.17MM
14.843
377.01MM
15.843
402.41MM
16.405
416.68MM
16.562
420.67MM
SHADED AREA
BURNT ORANGE
.250 DIA. HOLES
TYP. 16 PLACES
6.437
163.49MM
7.062
179.37MM
7.688
195.27MM
NON ILLUMINATED DETAIL

NO	DESCRIPTION	DATE	APPR'VD
2	REDRAWN PER C/O 11 (388)	1-12-78	SKN



5. BACKGROUND TO BE MATTE BLACK, EXCEPT WHERE SHOWN ON SHEET 1.

4. LINES AND LETTERING TO BE BURNT ORANGE, CANDOC SS-119 OR EQUIVELANT.

3. ALL LETTERING TO BE 8PT. FUTURA UNLESS OTHERWISE NOTED.

2. ALL LINEWORK TO BE .031 WIDE UNLESS OTHERWISE SPECIFIED.

1. ALL DIMENSIONS IN MM ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

REPAIR

OCT 22 1979

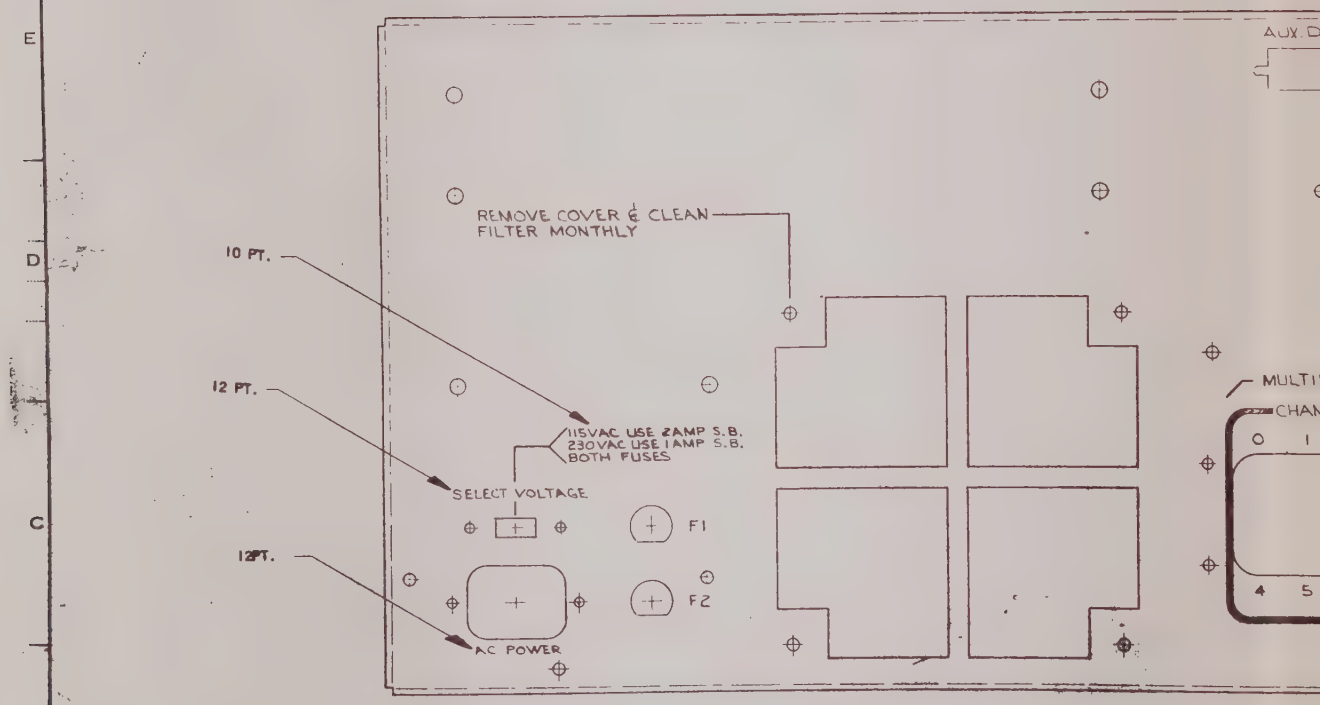
NOTES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: DISPLAY PANEL SILKSCREEN
ALL TOLERANCES ARE ± .015	
ALL BENDS ARE 90° ± ½°	
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3 32 RAD	FINISH — ETCH AND TROCTS; PAINT — FEDERAL SPEC 595 COLOR 26497; R AND S VINYL 8080 W24; SCREEN PER
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	~~MATERIAL~~ ~~ALUMINUM~~ ~~5052 H34~~ ~~3003 H14~~

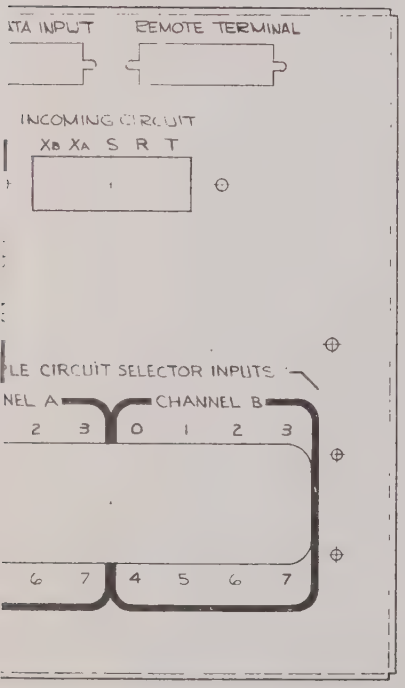
NORTHEAST ELECTRONICS

DRAWN	RG	DATE 2-78	SCALE 1/1
CHECKED		DATE	
APPROVED	SKN	DATE 1-12-78	
SIZE D	NUMBER C041-3-004	ISSUE 2	

SHEET 2 1


AUX.D
REMOVE COVER & CLEAN
FILTER MONTHLY
10 PT.
12 PT.
115VAC USE 2AMP S.B.
230VAC USE 1AMP S.B.
BOTH FUSES
SELECT VOLTAGE
F1
F2
12PT.
AC POWER
MULTI
CHAN
0 1
4 5

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9 [illegible]	[illegible]



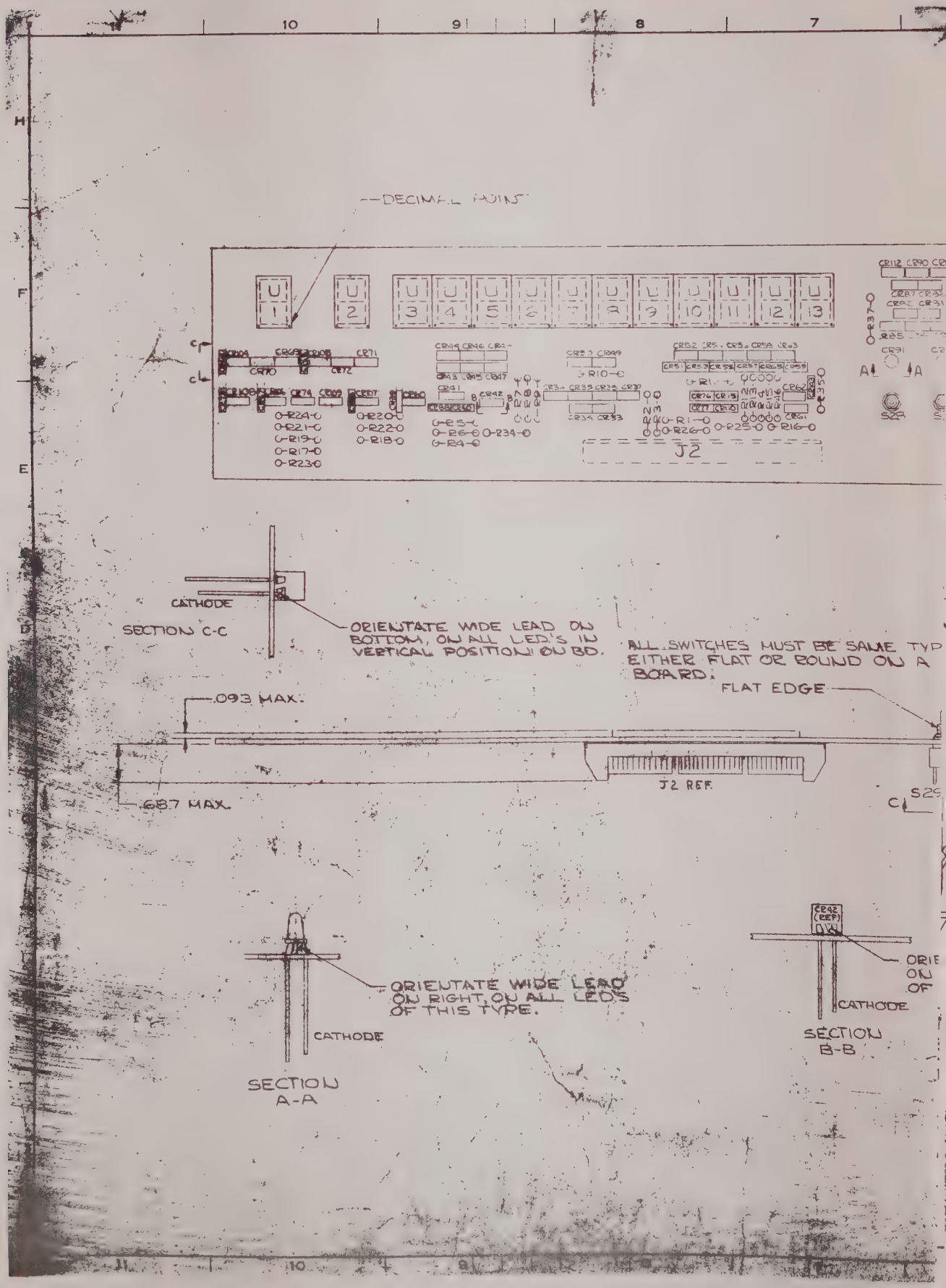
4. BAND AROUND CHANNEL SELECTOR TO BE .070" WIDE.
3. LINE WORK TO BE .015 WIDE.
2. ALL LETTERING IS TO BE 14PT. FUTURA UNLESS OTHERWISE NOTED.
1. ALL SCREENING IS TO BE BLACK.

NOTES

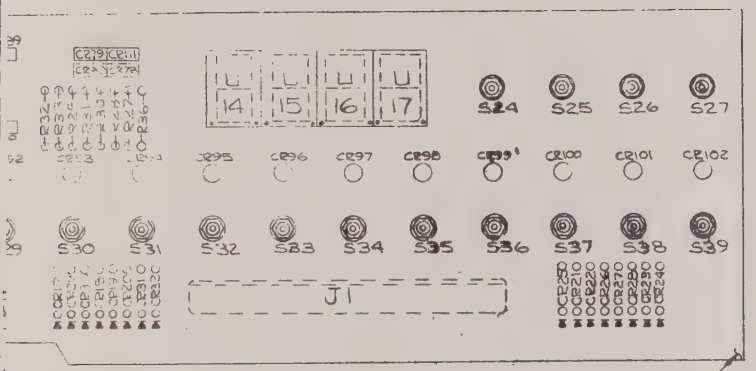
REPAIR

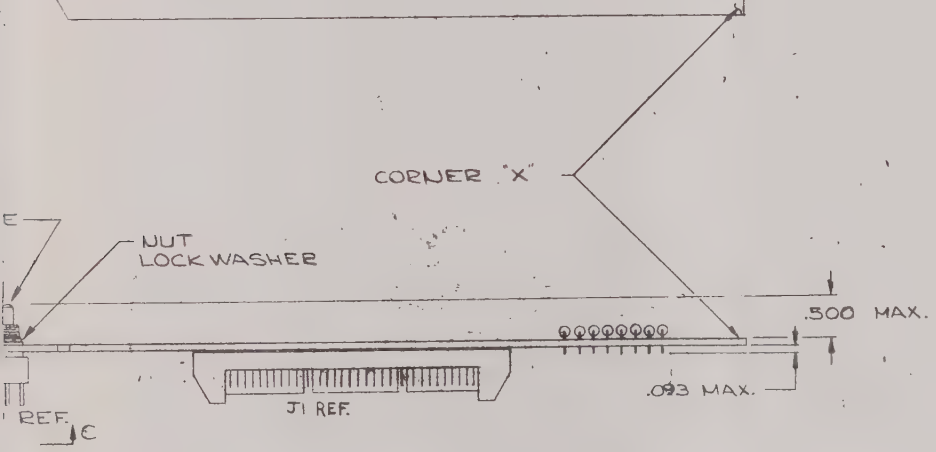
OCT 22 1975

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: REAR PANEL SILKSCREEN	NORTHEAST ELECTRONICS	
ALL TOLERANCES ARE ± .015			
ALL BENDS ARE 90° ± ½°			
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3.32 RAD	FINISH — ~~EPOXY AND WHITE PAINT — FEDERAL SPEC. 595 COLOR 27911~~ R AND S VINYL 4088, W24	MATERIAL: ALUMINUM 5052 H34 3003 H14	DRAWN [illegible] DATE 3/27 SCALE
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	SCREEN PER [illegible]		CHECKED [illegible] DATE [illegible]
			APPROVED DATE
			SIZE D NUMBER 0041-13-005


--DECIMAL POINT
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
U13
J2
CATHODE
SECTION C-C
ORIENTATE WIDE LEAD ON BOTTOM, ON ALL LED'S IN VERTICAL POSITION ON BD.
ALL SWITCHES MUST BE SAME TYP
EITHER FLAT OR ROUND ON A BOARD.
FLAT EDGE
.093 MAX.
.687 MAX.
J2 REF.
ORIENTATE WIDE LEAD ON RIGHT, ON ALL LED'S OF THIS TYPE.
CATHODE
SECTION A-A
CR42 (REF)
CATHODE
SECTION B-B

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	[illegible]	[illegible]
1	UPPED ED REV (68 (954)	6-22-[illegible]	[illegible]
2	ADD NEW LED'S & [illegible]	[illegible]	[illegible]
-	[illegible]	[illegible]	[illegible]





S24-S39 TO BE WIRED IN THIS MANNER

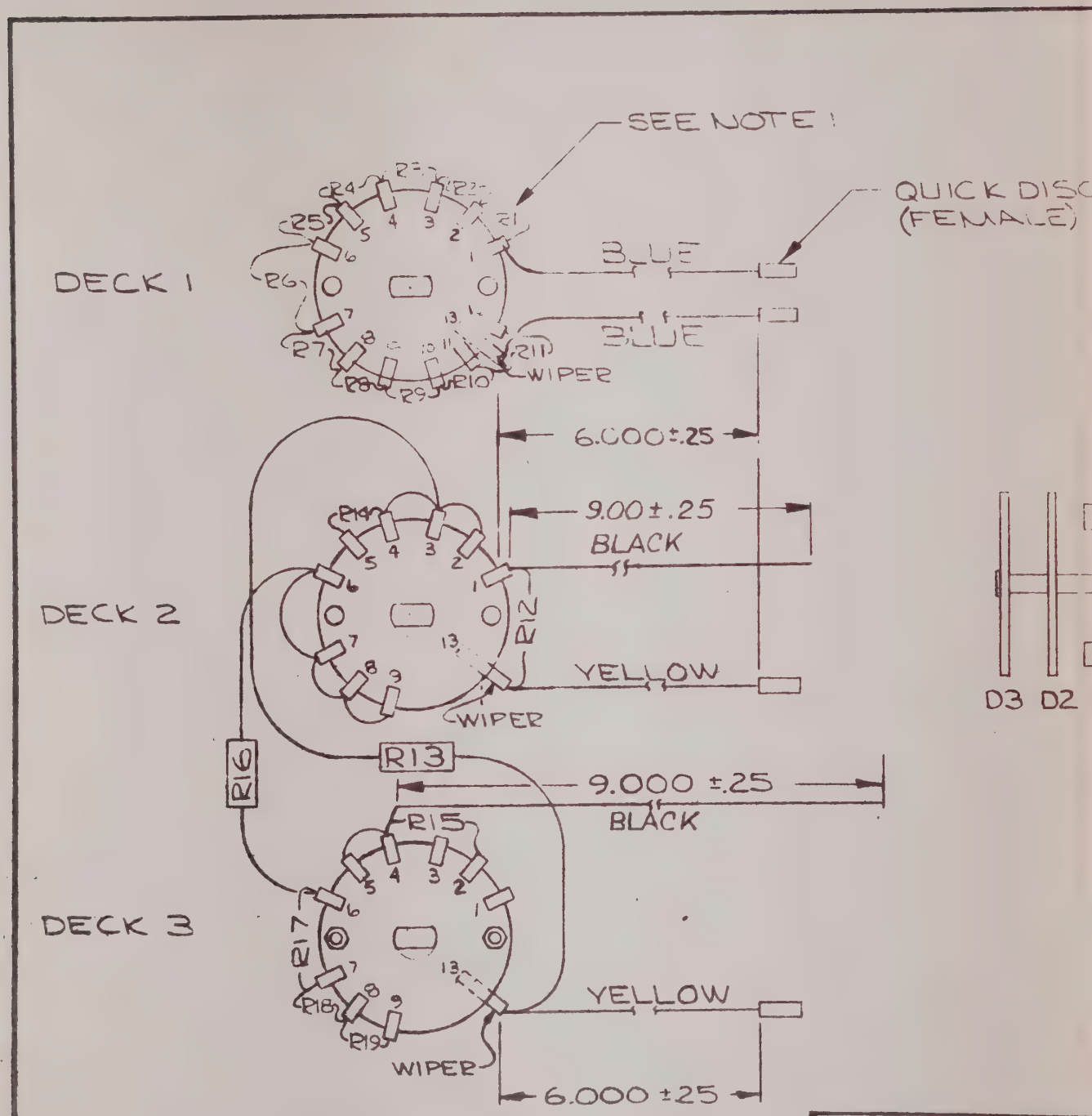
VIEW C-C

ENTATE WIDE LEAD RIGHT, ON ALL LED'S THIS TYPE

REPAIR

NOTES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ALL TOLERANCES ARE ± .015 ALL BENDS ARE 90° ± ½° BEND RADIUS AS FOLLOWS MATL .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD BREAK ALL SHARP EDGES DEBURR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	TITLE DISPLAY BD. ASSY 96-3 FINISH — ENGR AND PAINTED PAINT — FEDERAL SPEC STD COLOR 24172 A AND S VINYL DECAL W194 MATERIAL ALUMINUM SCREEN PER	NORTHEAST ELECTRONICS DRAWN [illegible] DATE [illegible] CHECKED [illegible] DATE [illegible] APPROVED SLN DATE [illegible] SIZE D NUMBER 0041-13-010

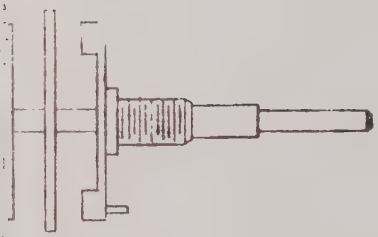


REAR VIEW

UNLESS OTHERWISE SPECIFI DIMENSIONS ARE IN INCH
ALL TOLERANCES ARE ± .0
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOW MAT'L .09 OR LESS, 1/64 RA MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	[illegible]
1	CORRECTED BLK WIRE % 7 (348)	11-3-77	[illegible]

OUNECT
4 PLACES



D1

OCT 22 1979

REPAIR

I KEEP RESISTORS CLOSE TO
SWITCH BODY AS POSSIBLE.

NOTES

ED
S
15

TITLE
LOOP / LEAK NETWORK

NORTHEAST ELECTRONICS

S
D

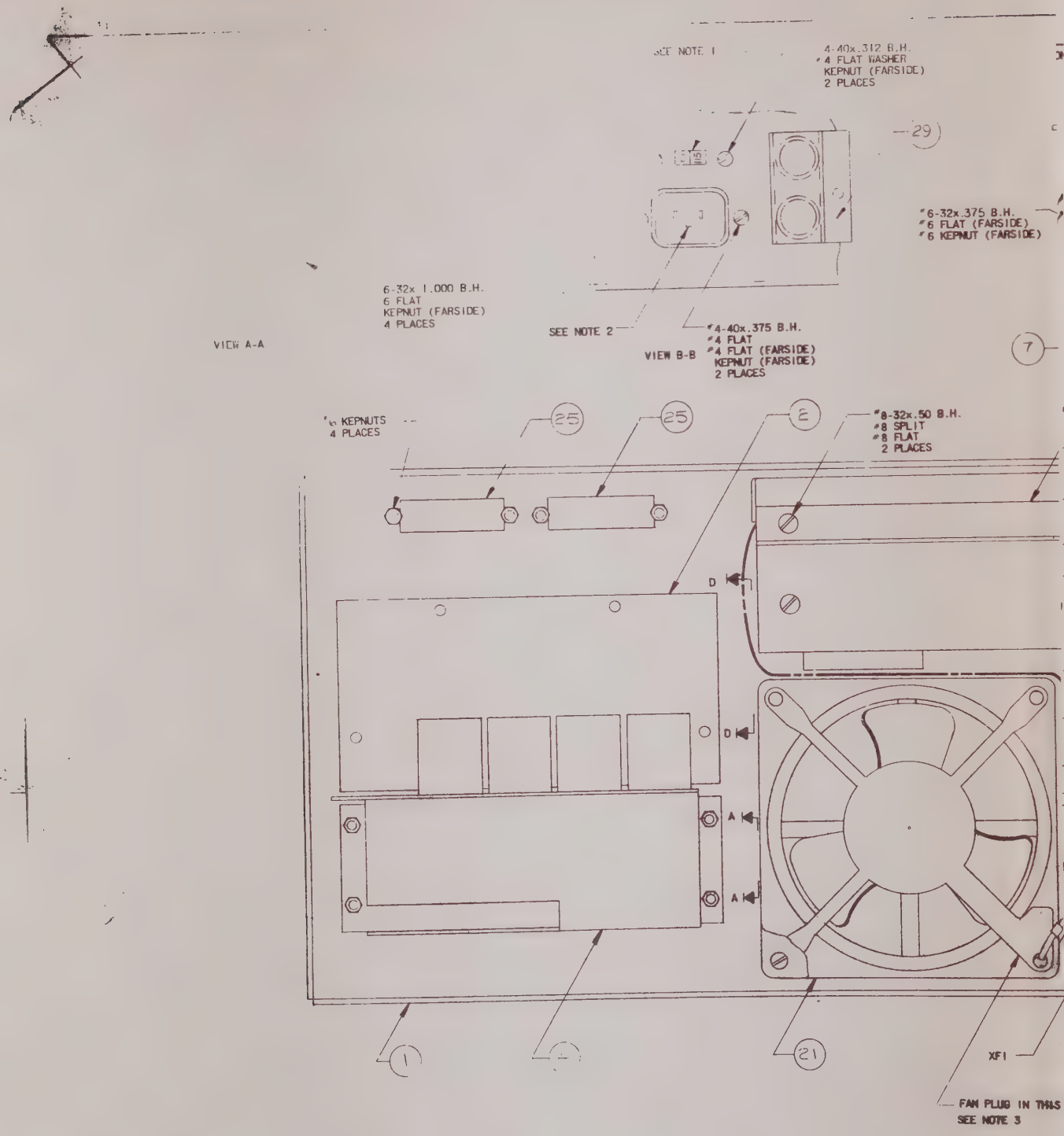
~~FINISH — ETCH AND IRIDITE~~
~~PAINT — FEDERAL SPEC. 595~~
~~COLOR 26492~~
~~R AND S VINYL 8050, W24~~

~~MATERIAL~~
~~ALUMINUM~~
~~5052 H34~~
~~3003 H14~~

DRAWN MCF DATE 7/1/77 SCALE —
CHECKED P.P. DATE 7-13-77
APPROVED S.K.N DATE 7-21-77

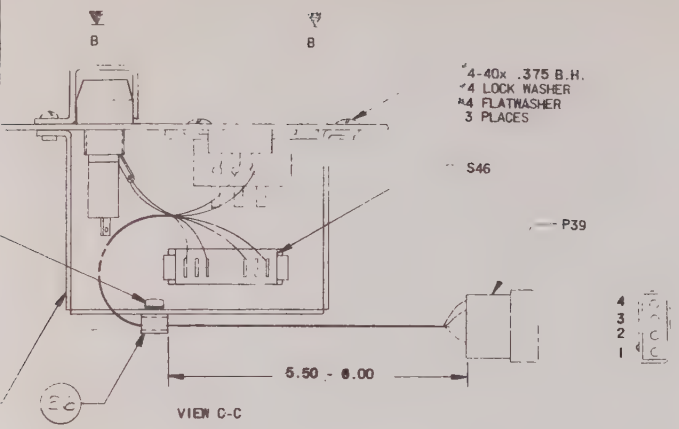
~~SCREEN PER~~ SCHEMATIC B-0041-13-353

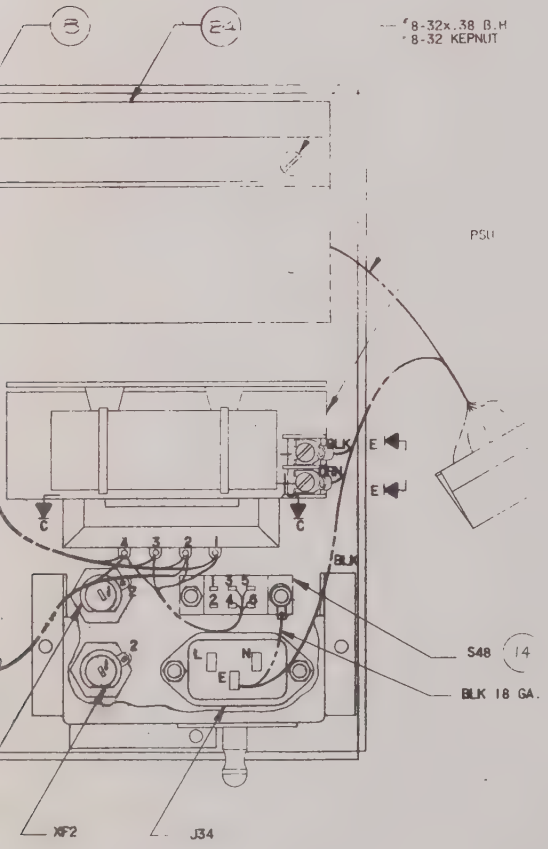
SIZE B | NUMBER 0041-13-052 | ISSUE 1


SEE NOTE 1
4-40x.312 B.H.
#4 FLAT WASHER
KEPNUT (FARSIDE)
2 PLACES
29
#6-32x.375 B.H.
#6 FLAT (FARSIDE)
#6 KEPNUT (FARSIDE)
6-32x 1.000 B.H.
6 FLAT
KEPNUT (FARSIDE)
4 PLACES
SEE NOTE 2
#4-40x.375 B.H.
#4 FLAT
#4 FLAT (FARSIDE)
KEPNUT (FARSIDE)
2 PLACES
VIEW A-A
VIEW B-B
7
#6 KEPNUTS
4 PLACES
25
25
2
#8-32x.50 B.H.
#8 SPLIT
#8 FLAT
2 PLACES
D
D
A
A
1
21
XF1
FAN PLUG IN THIS
SEE NOTE 3

REVISIONS

NO	DESCRIPTION	DATE	APPROVAL
		9-22-77	GLR
		12-5-77	SKN
	CHG ITEM 2 TO HARDWARE FROM	1-13-78	SKN
	CHG ITEM 2 TO HARDWARE FROM	4-11-78	R/L





OCT 23 1979 REPAIR

ORNER

3 ADD TY-RAP AROUND FAN

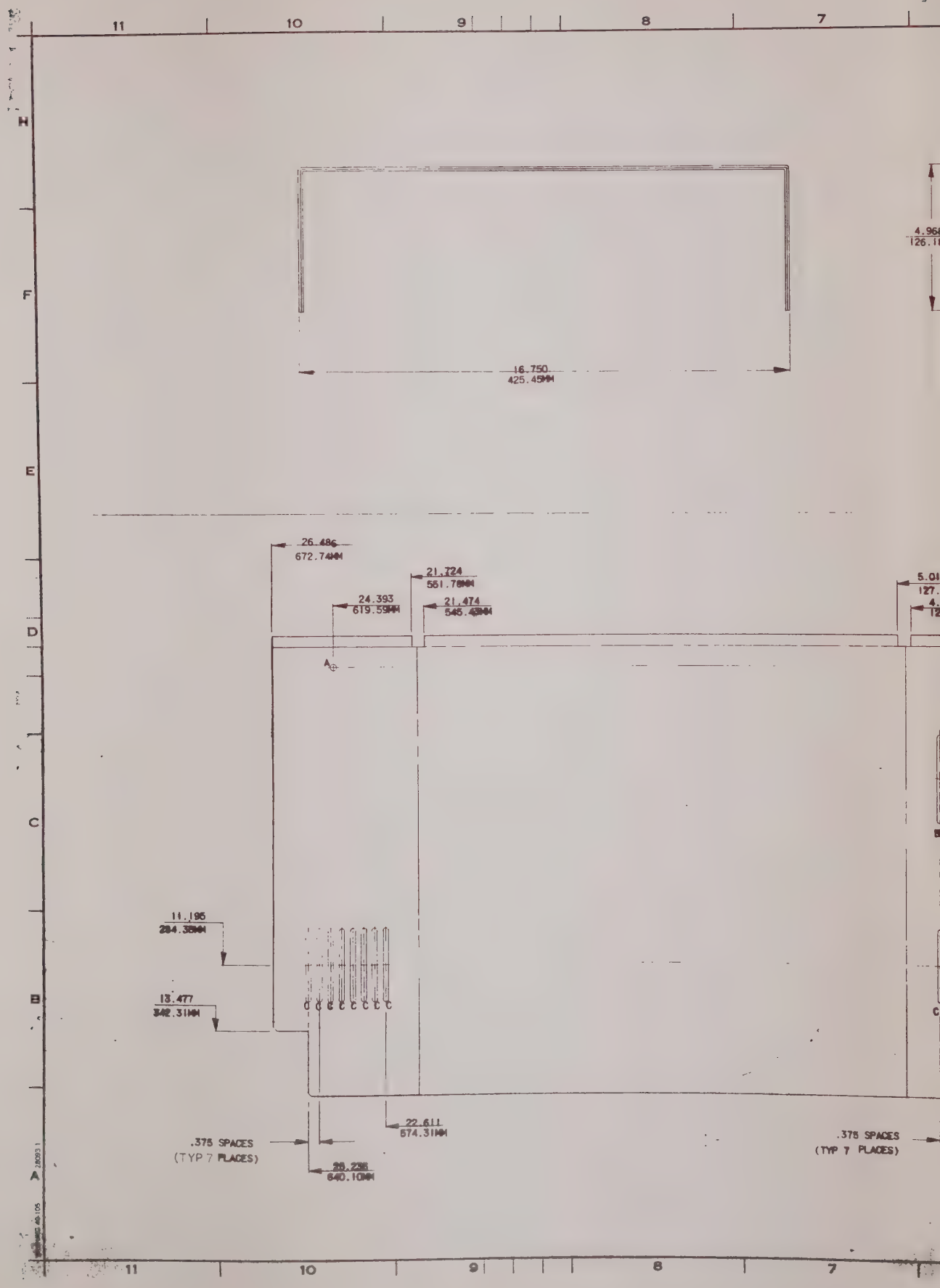
2 CENTER PIN TO

1 "1.15" TO SHO

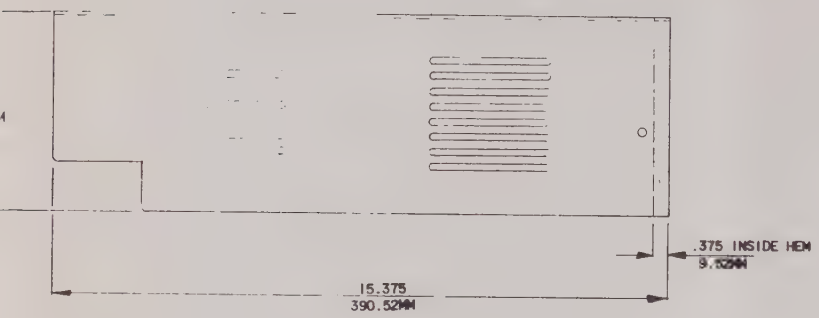
NOTES

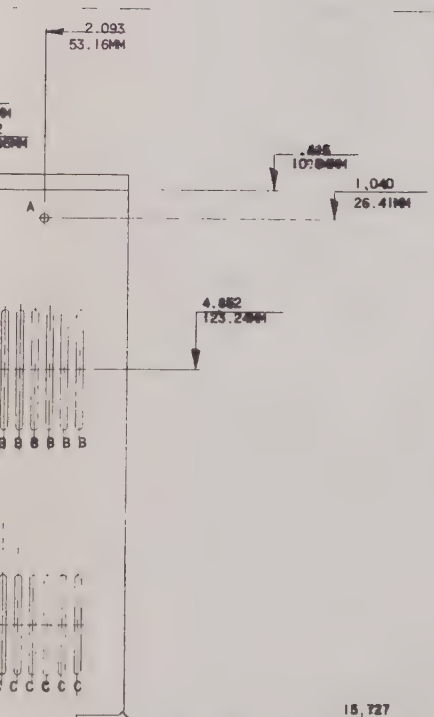
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE REAR PANEL ASSEMBLY	
ALL TOLERANCES ARE ± .015		
ALL BENDS ARE 90° ± ½°		
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD	FINISH — ETCH AND IRIDITE PAINT — FEDERAL SPEC. 595 COLOR 26492 R AND S VINYL [illegible] WHT	MATERIAL ALUMINUM [illegible] H14 [illegible] 3003 H14
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	SCRIBED PER	

3 2


11
10
9
8
7
H
F
E
D
C
B
A
16.750
425.45MM
26.486
672.74MM
21.724
551.78MM
24.393
619.59MM
21.474
545.43MM
A
11.195
284.35MM
13.477
342.31MM
22.611
574.31MM
.375 SPACES
(TYP 7 PLACES)
25.236
640.10MM
.375 SPACES
(TYP 7 PLACES)

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
0		9-22-77	S.K.M





HOLE SCHEDULE			
HOLE	SIZE	NO REQ	REMARKS
A	7/32	2	.218 DIA.
B		8	.125 X 3.000 OVAL
C		16	.125 X 2.500 OVAL
D			
E			
F			

NOTES

1. ALL DIMENSIONS IN "MM" ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

OCT 22 1979

REPAIR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90°
BEND RADIUS AS FOLLOWS: MAT'L .09 OR LESS, .04 RAD; MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES, DEBUR ALL HOLES, SAND ALL SURFACES WITH FINE GRIT

TITLE: CASE, COVER DETAIL

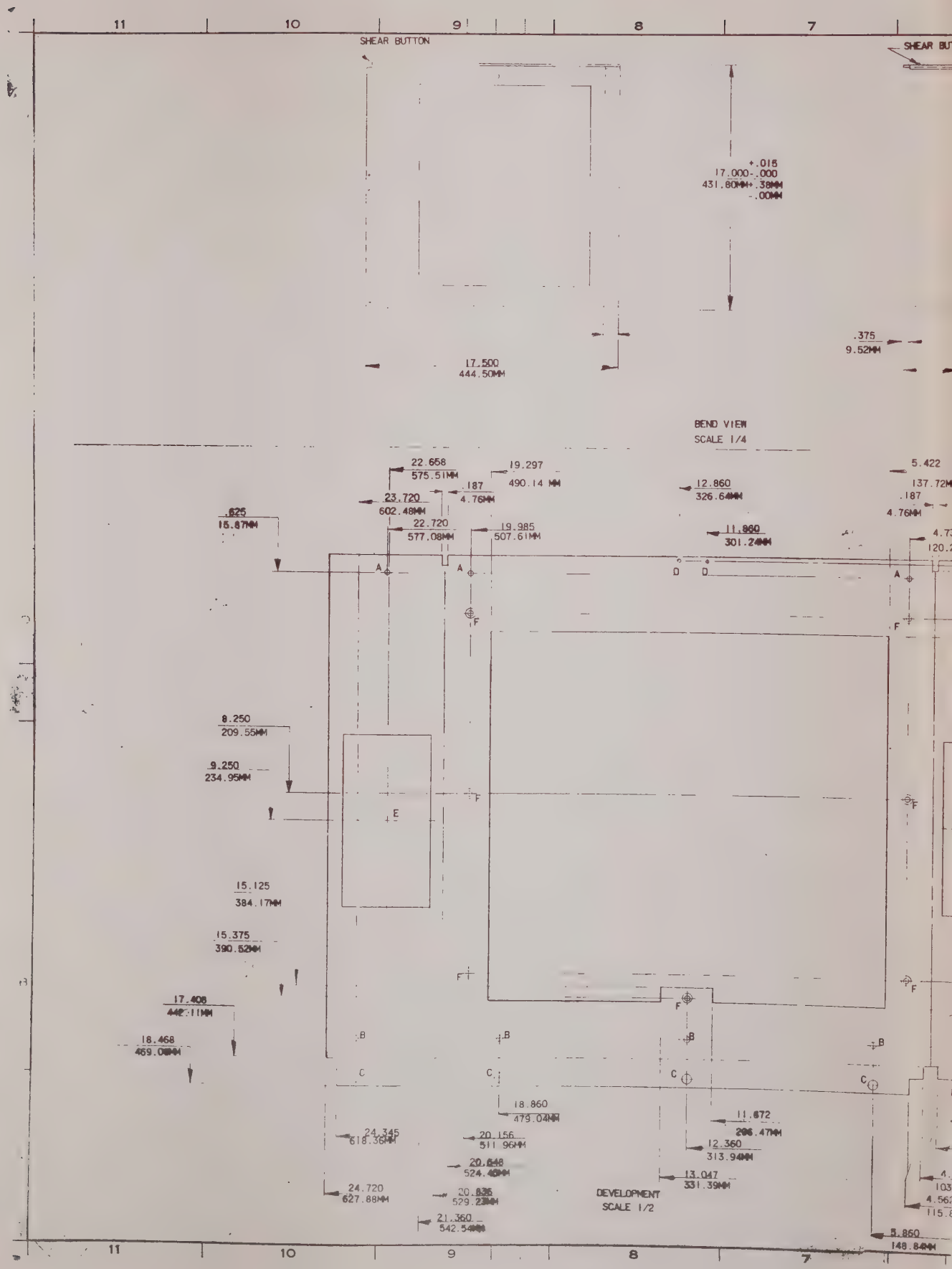
FINISH — ETCH AND IRIDITE
PAINT FEDERAL SPEC. 595 COLOR 26492 TEXTURED
~~8 AND 6 MILS, GLOSS, WHITE~~
SCREEN PER

MATERIAL: ALUMINUM ~~5052-H34~~ 3003 H14 .032

NORTHEAST ELECTRONICS INT

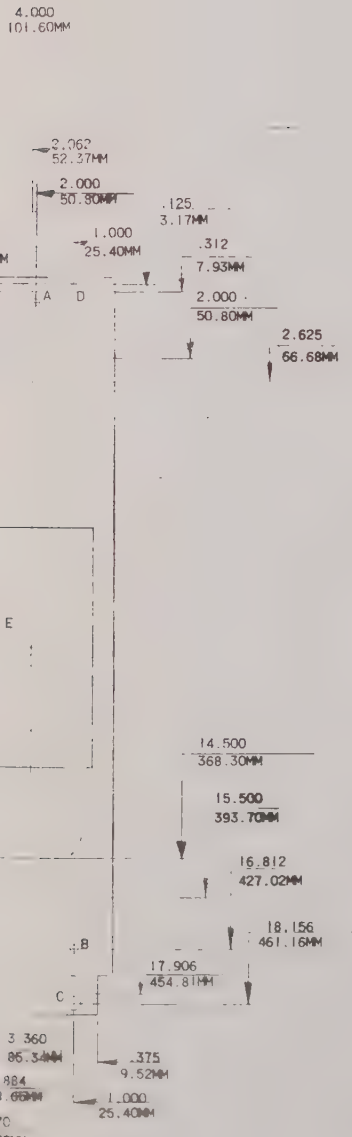
DRAWN JPM DATE 2/11/77 SCALE 1/2
CHECKED DATE
APPROVED S.K.M DATE

SIZE D NUMBER 0041-13-105 REV 0


11
10
9
8
7
SHEAR BUTTON
SHEAR BU
+.015
17.000-.000
431.80MM+.38MM
-.00MM
.375
9.52MM
17.500
444.50MM
BEND VIEW
SCALE 1/4
22.658
575.51MM
19.297
490.14 MM
.187
4.76MM
23.720
602.48MM
12.860
326.64MM
.625
15.87MM
22.720
577.08MM
19.985
507.61MM
11.860
301.24MM
5.422
137.72M
.187
4.76MM
A
D
F
8.250
209.55MM
9.250
234.95MM
E
15.125
384.17MM
15.375
390.52MM
17.406
442.11MM
18.468
469.08MM
B
C
18.860
479.04MM
11.672
296.47MM
24.345
618.36MM
20.156
511.96MM
12.360
313.94MM
20.648
524.40MM
13.047
331.39MM
24.720
627.88MM
20.835
529.23MM
DEVELOPMENT
SCALE 1/2
21.360
542.54MM
5.860
148.84MM

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
0		9	
1	ADD SHEAR BUTTONS (431)	3-11-77	
—		6	

SHEAR BUTTONS



HOLE SCHEDULE			
HOLE	SIZE	NO. REQ	REMARKS
A	1/8	4	TOOLING HOLES
B	#13	5	
C	5/16	5	
D	1/8	3	SHEAR BUTTONS
E		2	3.125 X 6.031 RECT
F	3/16	7	INSTALL 6-32 PEM

NOTES

4. PAINT PER: ROYMAL PAINT
GRAY LO-TEMP CURE
EPOXY VINYL ENAMEL
NO. 772-503 OR EQUAL.

REPAIR

3. DO NOT SAND PRIOR TO FORMING.

2. DO NOT ETCH OR IRIDITE. SPOT WELDING REQUIRED.

1. ALL DIMENSIONS IN "MM" ARE ±.38MM
UNLESS OTHERWISE SPECIFIED.

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UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS
MATL .09 OR LESS 1 64 RAD
MATL .125, 3 32 RAD
BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES
WITH FINE GRIT

TITLE
CASE, BOTTOM
DETAIL

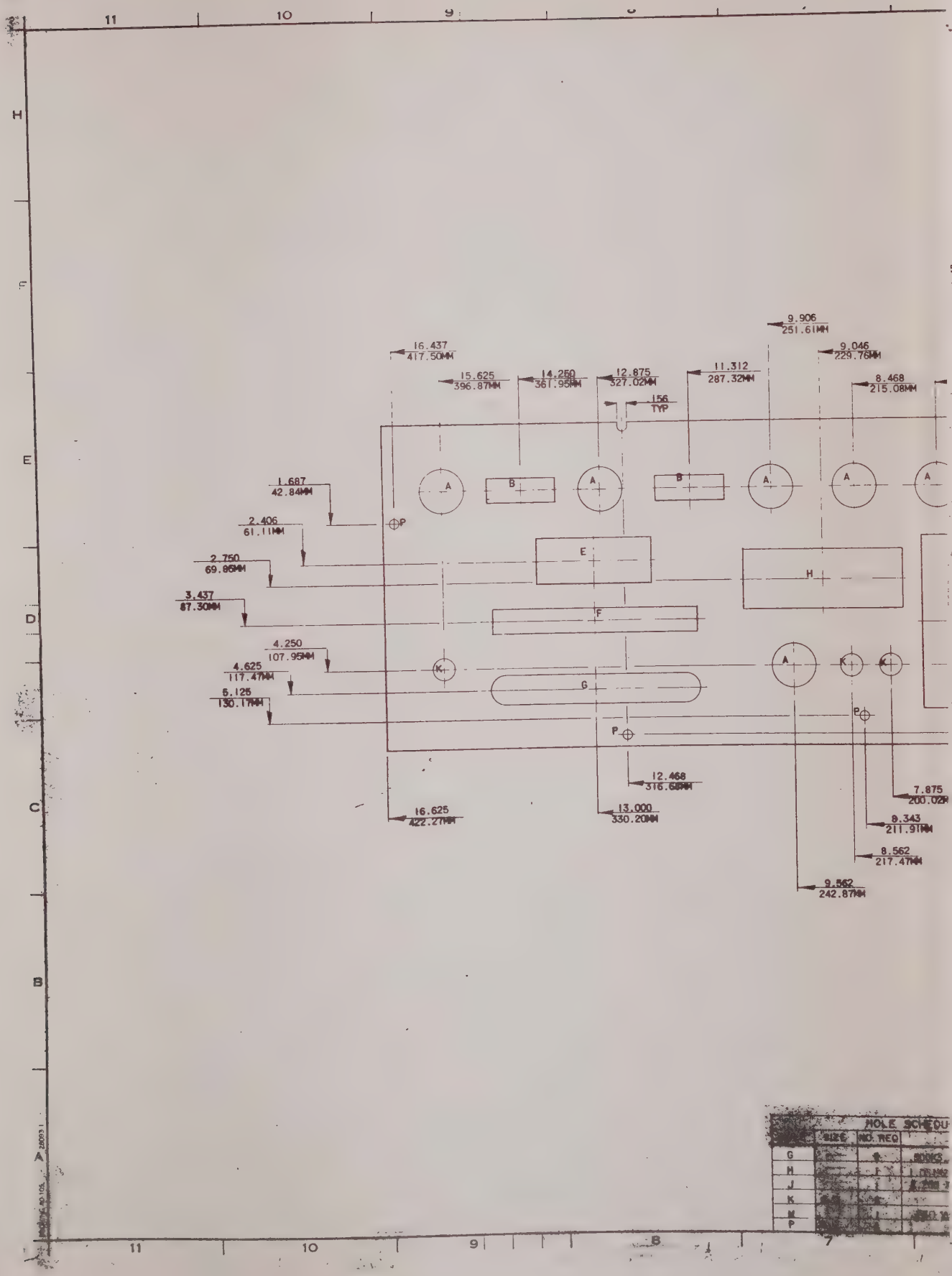
~~FINISH~~ ~~PAINT AND NOTE~~
~~PAINT FEDERA SPEC 595~~
~~COLOR 26492~~
~~AND SYNY 8050 W34~~
SCREEN PER

MATERIAL
~~ALUMINUM~~
~~5056 H34~~
3003 H14
.093

NORTHEAST ELECTRONICS nt
CONCORD, NEW HAMPSHIRE

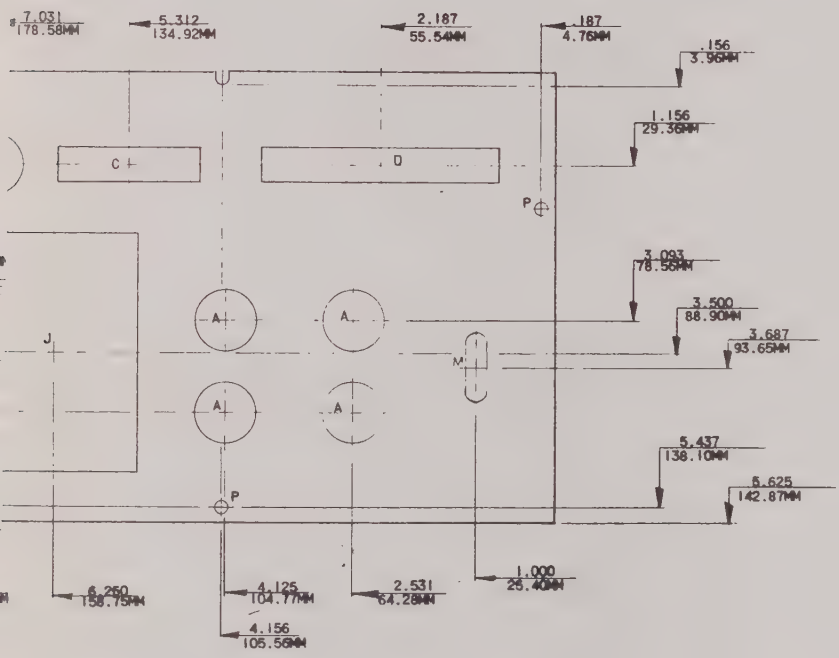
DRAWN	DATE	SCALE
CHECKED	DATE	
APPROVED	DATE 2-24-77	

SIZE D | NUMBER 41-0-38 | ISSUE 2



	HOLE SCHEDU		
	SIZE	NO. REQ	
G		4	
H		1	
J		1	
K		4	
M		1	
P		1	

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	OR RELEASE 1625	9-26-79	SLM



OCT 22 1979

1. ALL DIMENSIONS IN "MM" ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

NOTES

REPAIR

REMARKS	HOLE SCHEDULE			
	HOLE	SIZE	NO. REQ	REMARKS
25 1/4R	A	28/32	16	.281 DIA.
281 RECT	B	—	2	.437X1.203 RECT
5.000 RECT	C	—	1	.437X1.781 RECT
	D	—	1	.437X2.968 RECT
75 X .25	E	—	1	.843 X 2.031 RECT
	F	—	1	.437X3.562 RECT

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MATL .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE: FRONT PANEL DETAIL

FINISH — ETCH AND IRIDITE
PAINT - FEDERAL SPEC 595 COLOR 26492
R AND S VINYL 9000, W34

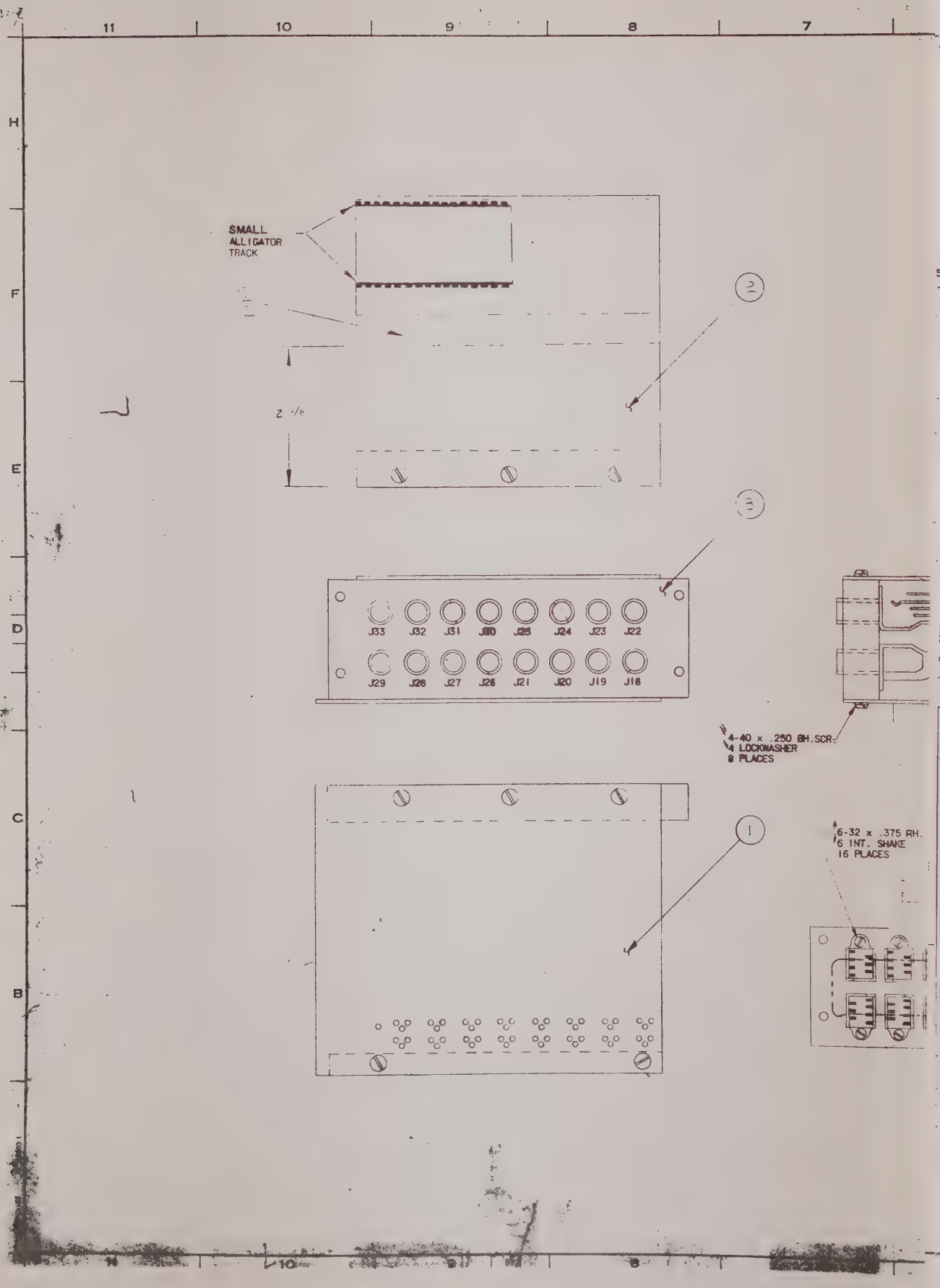
MATERIAL: ALUMINUM 5052 H34 .062

SCREEN PER

NORTHEAST ELECTRONICS nt

DRAWN	DATE 4/25/77	SCALE 1/1
CHECKED		DATE
APPROVED SLM		DATE 7-22-77
SIZE D	NUMBER C041-13-100	

6 5 4 3 2 1


SMALL
ALLIGATOR
TRACK
2 1/8
J33 J32 J31 J30 J25 J24 J23 J22
J29 J28 J27 J26 J21 J20 J19 J18
4-40 x .250 BH.SCR.
4 LOCKWASHER
8 PLACES
6-32 x .375 RH.
6 INT. SHAKE
16 PLACES
1
2
3

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9 [illegible]	[illegible]
1	ADDED MISC. MFG. INFO.	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

BLACK (BOTT.- ROW JACK)

T R
R S
S T

8 PLACES

8 PLACES

BOTTOM ROW JACKS

TIP GREEN
RING RED
SLEEVE YEL.

T R
R S
S T

RED RING
YEL. SLEEVE
GREEN TIP

TOP ROW JACKS

PC BD. JACK WIRING
DETAIL A-A

A
YEL.
RED
GRN.
A

YEL.
RED
GRN.

DETAIL A-A

SCR.

SEE NOTE 5

YEL.

7 6
5
4 RED
3
2 GRN
1

TOP ROW

DETAIL B-B

GRN
RED

1
2
3
4
5
6
7

YEL

BOTTOM ROW

C
O

VIEW A-A

BLK
SEE NOTE 3

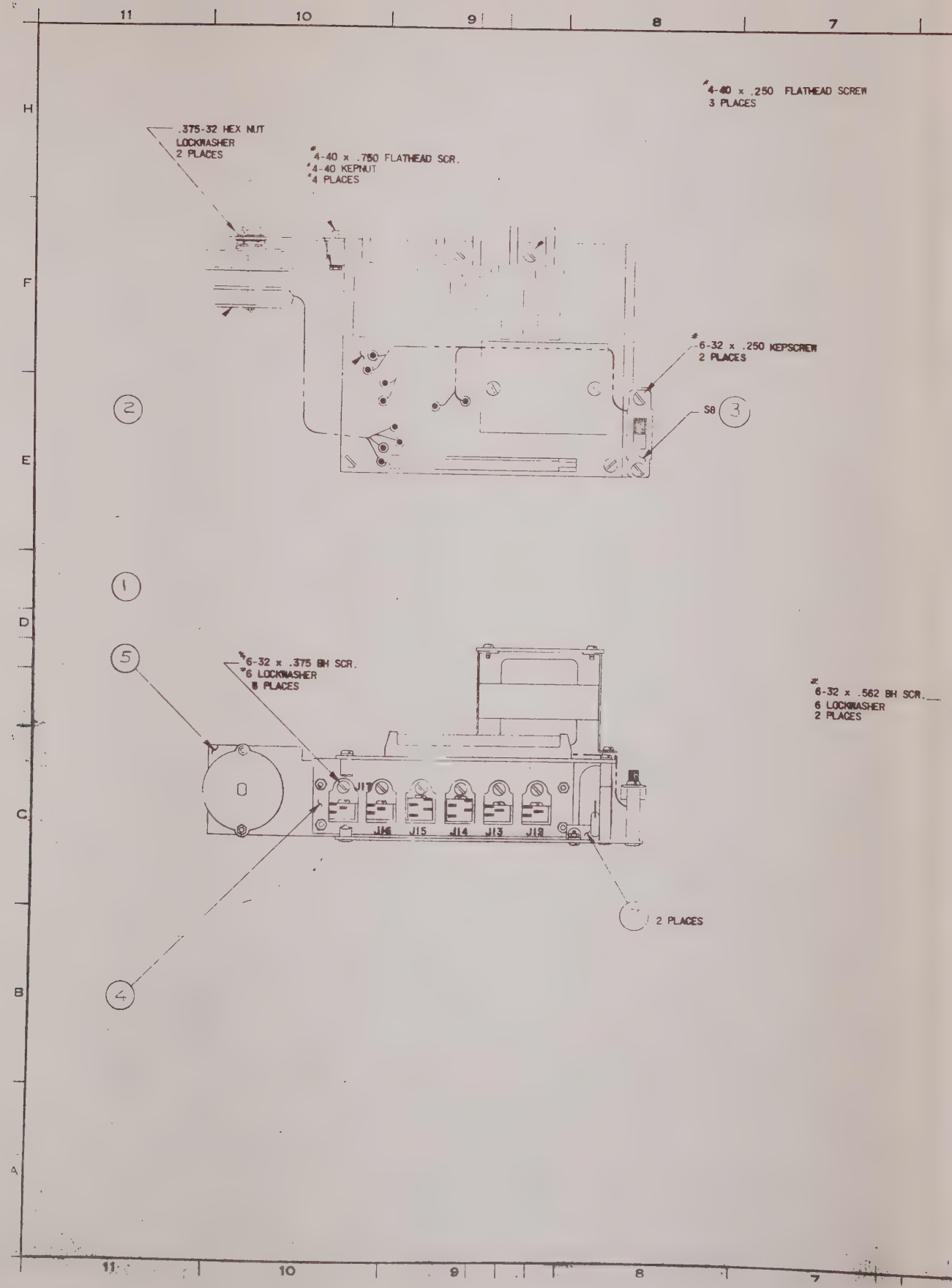
JACKS WIRING
DETAIL B-B
SEE NOTES 1 AND 2

4. BUSS STRAP PINS 6+7 TO ALL JACKS AS SHOWN.
4. BUSS STRAP PIN 5 ON ALL JACKS AS SHOWN.
3. BLACK WIRE TO BE LAYED OUT AS SHOWN AND SOLDERED TO PIN 5, MONITOR JACK BLOCK AS SHOWN IN VIEW A-A FOR PROPER PLACEMENT. NOTE HOLE LOCATIONS. REPAIR
2. ALL WIRES ON JACKS ARE 3" LONG EXCEPT BLACK.
1. ALL JACKS ARE WIRED AND NUMBERED AS SHOWN.

NOTES

OCT 22 1979

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ALL TOLERANCES ARE ± .015 ALL BENDS ARE 90° ± ½° BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS 1 64 RAD MAT'L .125 3 32 RAD BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	TITLE 41-3A MCS MODULE ASSEMBLE FINISH — ETCH AND MODIFY — MATERIAL PAINT — FEDERAL SPEC. STD COLOR 36492 R AND S VISCOL 8050, W24 ALUMINUM 5052-H34 3003-H14 DRAWN PER D-0041-3-316	NORTHEAST ELECTRONICS nt DRAWN CF DATE 4/20/71 SCALE 1/1 CHECKED DATE APPROVED SFH DATE 7-21-71 SIZE D NUMBER 0041-43-049 ISSUE 5	


4-40 x .250 FLATHEAD SCREW
3 PLACES
.375-32 HEX NUT
LOCKWASHER
2 PLACES
4-40 x .750 FLATHEAD SCR.
4-40 KEPNUT
4 PLACES
6-32 x .250 KEPSCREW
2 PLACES
S8
3
2
1
5
6-32 x .375 BH SCR.
#6 LOCKWASHER
8 PLACES
6-32 x .562 BH SCR.
6 LOCKWASHER
2 PLACES
J17
J16
J15
J14
J13
J12
2 PLACES
4

J12 - J17 WIRE LIST

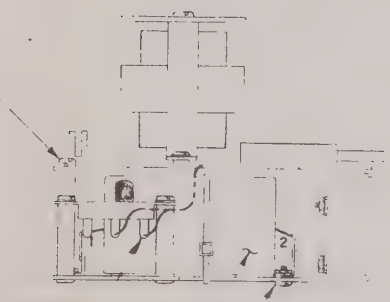
FROM	TO PC BD. HOLE	COLOR	TITLE
J17-1	18	GREEN	EXT. TIP
J17-2	19	RED	EXT. RING
J17-3	20	YELLOW	EXT. SLEEVE
J16-1	15	GREEN	BRIDGE TIP
J16-2	16	RED	BRIDGE RING
J16-3	17	YELLOW	BRIDGE SLEEVE
J15-1	10	GREEN	CHB TIP
J15-2	11	RED	CHB RING
J15-3	13	BLUE	CHB CONTACT
J15-4	14	PURPLE	CHB CONTACT
J15-5	12	YELLOW	CHB SLEEVE
J14-1	5	GREEN	CHA TIP
J14-2	6	RED	CHA RING
J14-3	8	BLUE	CHA CONTACT
J14-4	9	PURPLE	CHA CONTACT
J14-5	7	YELLOW	CHA SLEEVE
J13-1	3	GREEN	TIP
J13-3	4	YELLOW	SLEEVE
J12-1	1	GREEN	TIP
J12-3	2	YELLOW	SLEEVE

ABOVE WIRES TO BE 3" LONG, STRANDED. (22 GA.)

QUICK DISCONNECT WIRE LIST

FROM	LUG ON PC BOARD	COLOR	REMARK
S8	34	ORANGE	
S8	31	YELLOW	
S8	33	RED	
S8	32	SLATE	
S43	23	BLUE	
S43	24	BLUE	EITHER WIRE CAN GO WITH EITHER POS.
S43	25	YELLOW	
S43	26	YELLOW	
S43	C7-1	BLACK	RUN WIRES UNDER JACKS.
S43	C7-2	BLACK	

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9-22-77	SKN
1	TEM. [illegible]	[illegible]	SKN
[illegible]	4-40 X 250 FH SCR. W/ [illegible]	[illegible]	[illegible]
C	C/O 12 (362)	[illegible]	[illegible]



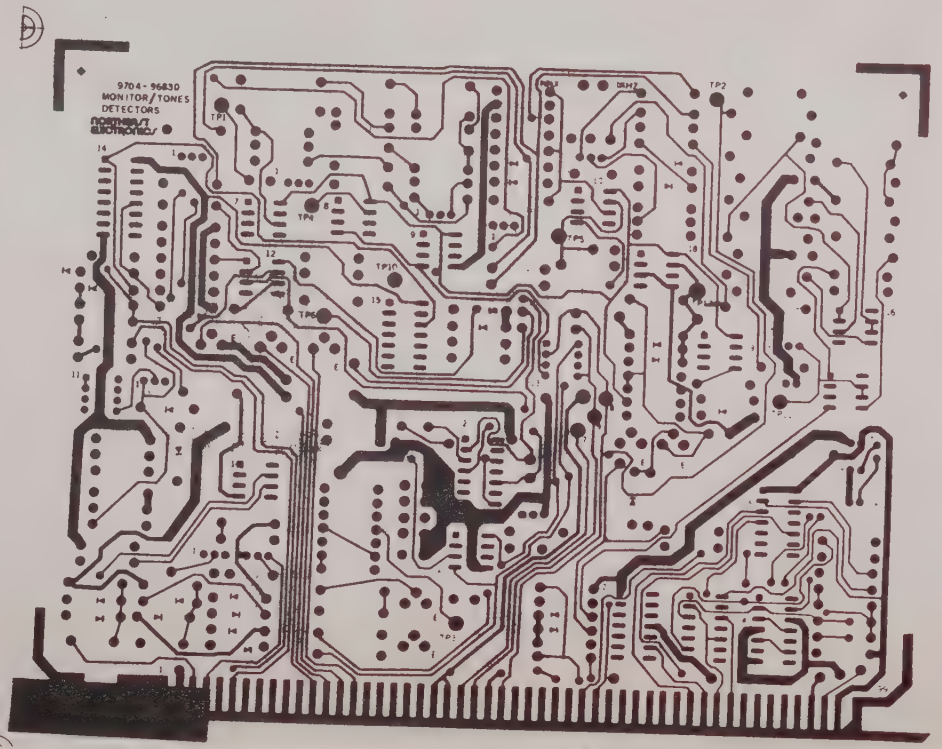
LATE WIRE

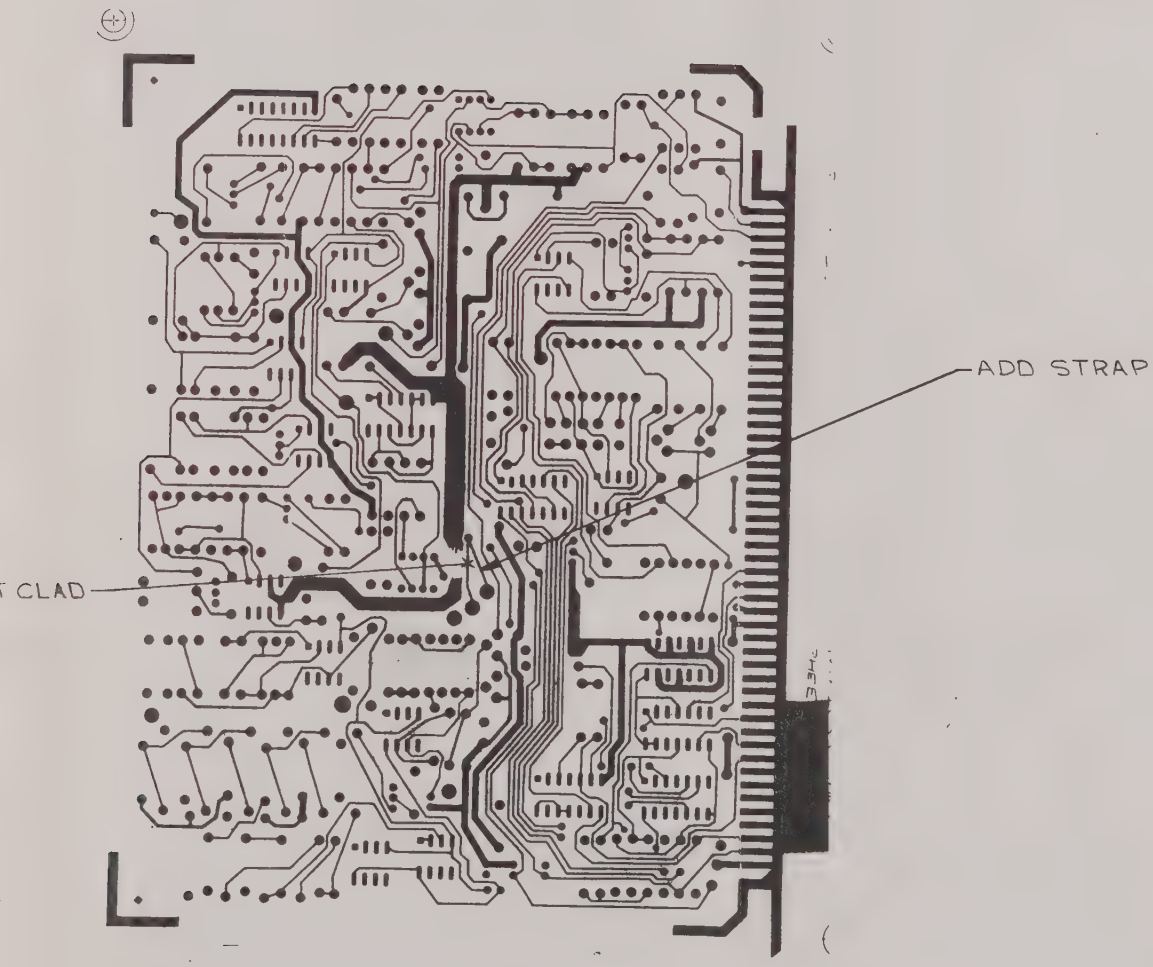
(6) — 4-40 x .250 BH SCR.
#4 KEPNUT
2 PLACES

9-22-1977 REPAIR

NOTES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: LINE CONTROL MODULE	NORTHEAST ELECTRONICS INT	
ALL TOLERANCES ARE ± .015			
ALL BENDS ARE 90° ± ½°			
BEND RADIUS AS FOLLOWS MATL .09 OR LESS 1/64 RAD MATL .125, 3/32 RAD	FINISH — ETCH AND IRIDITE; PAINT — FEDERAL SPEC. STD. COLOR 36495; R AND S VINYL 8850 W34	MATERIAL: ALUMINUM 5052 H34, 3003 H14	DRAWN — DATE — SCALE
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	SCREEN PER [illegible]		CHECKED — DATE [illegible]
			APPROVED SKN DATE [illegible]
			SIZE D — NUMBER [illegible] — ISSUE [illegible]

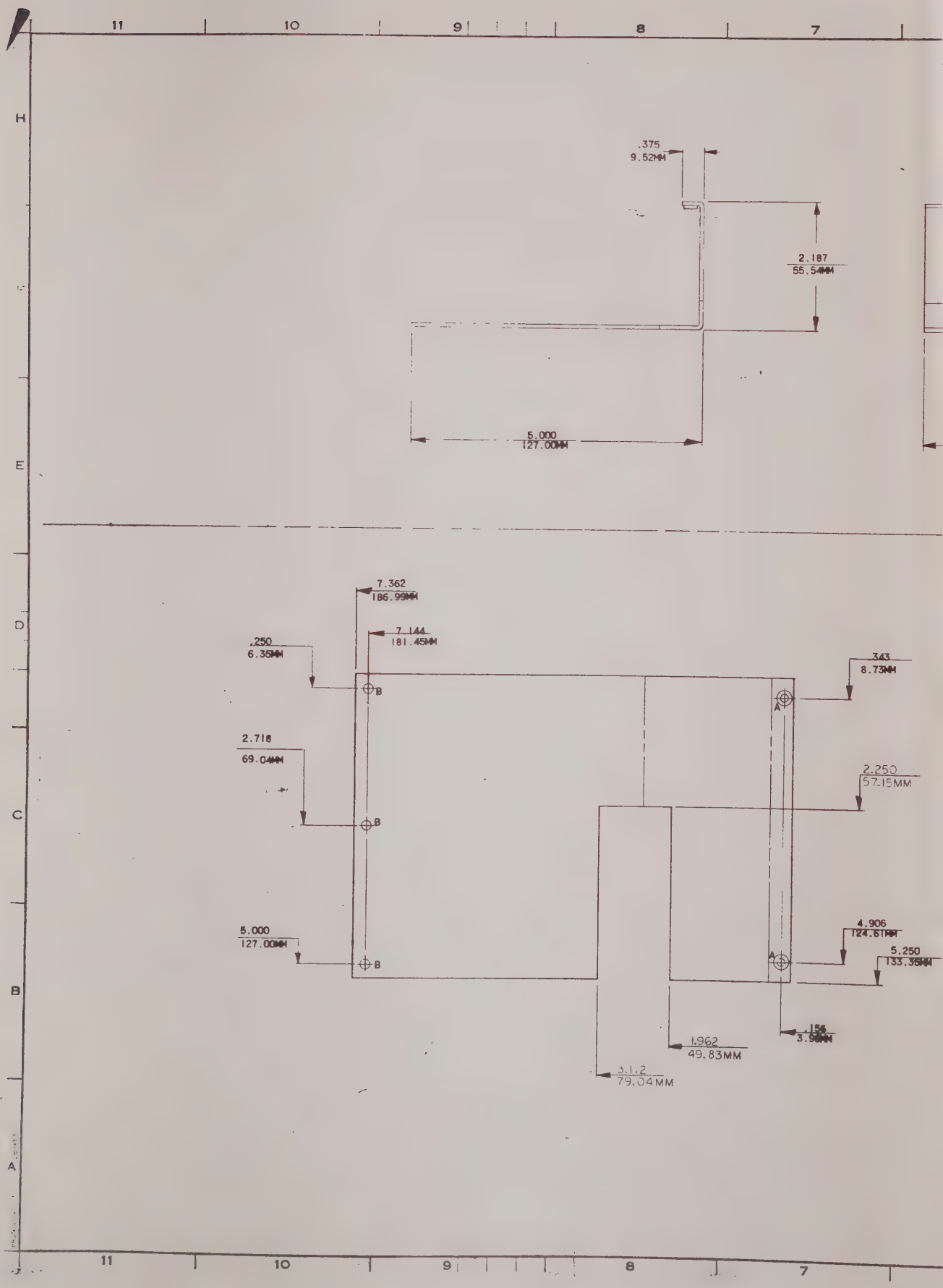

9704-96830
MONITOR/TONES
DETECTORS
northwest
electronics
TP1
TP2
TP4
TP10
TP6



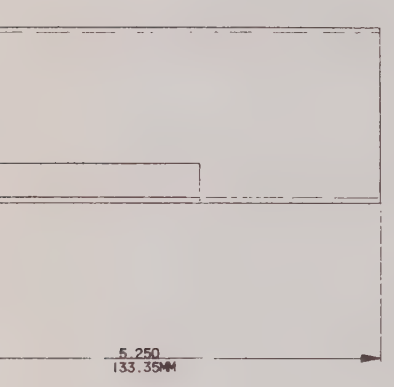
OCT 22 1979
REPAIR

SHEET 2 OF 2

SIZE	NUMBER
C	0041-13-021


11
10
9
8
7
H
G
E
D
C
B
A
.375
9.52MM
2.187
55.54MM
5.000
127.00MM
7.362
186.99MM
7.144
181.45MM
.250
6.35MM
2.718
69.04MM
5.000
127.00MM
B
A
.343
8.73MM
2.250
57.15MM
4.906
124.61MM
5.250
133.35MM
1.962
49.83MM
3.12
79.04MM

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SEM
1	MOVED ONE "B" HOLE C/O 4-1 TM 972	2-6-79	RJL



1 22 1979

1. ALL DIMENSIONS IN "MM" ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

NOTES

HOLE SCHEDULE			
HOLE	SIZE	NO. REQ	REMARKS
A	#19	2	INSERT 4-40 PEMS
B	#26	3	
C			
D			
E			
F			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS
MATL .09 OR LESS, 1/64 RAD
MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES WITH FINE GRIT

TITLE
41-3A MCS BRACKET DETAIL

FINISH — ETCH AND IRIDITE
PAINT — FEDERAL SPEC. ~~595~~ COLOR ~~26492~~
& AND S VINYL ~~8080 WHT~~

MATERIAL
ALUMINUM ~~5052-H34~~ 3003 H14 .062

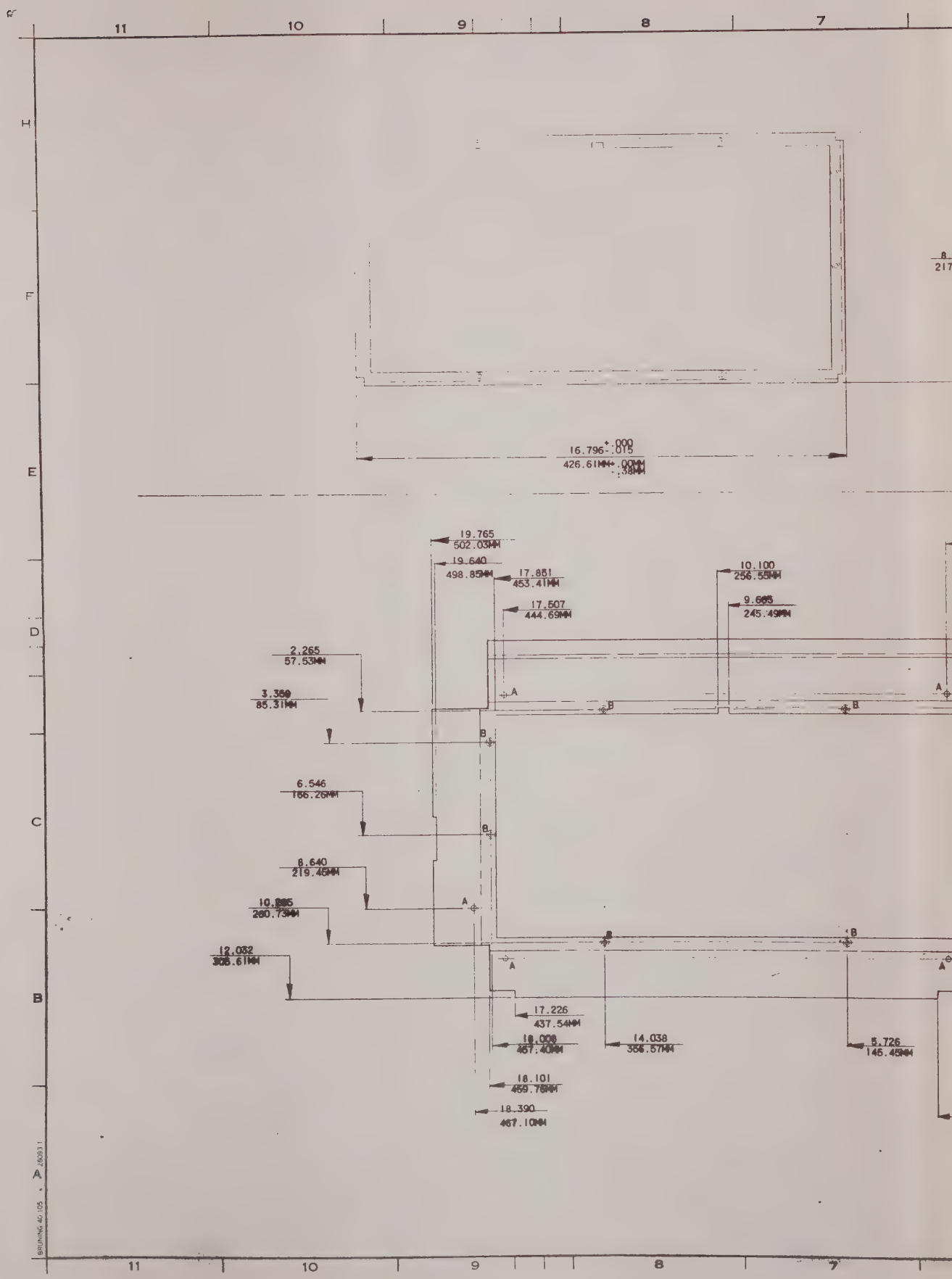
~~DRAWN PER~~

NORTHEAST ELECTRONICS Int

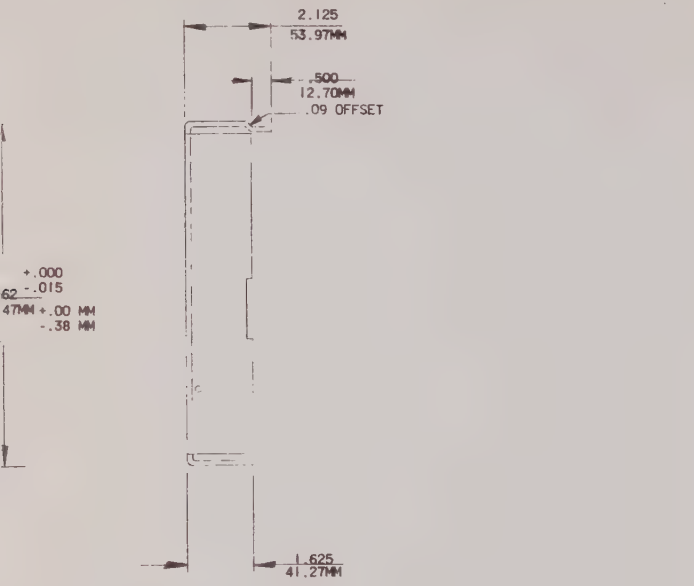
DRAWN [illegible] DATE 2/27/79 SCALE 1/1
CHECKED [illegible] DATE 3-5-79
APPROVED [illegible] DATE 3-14-79

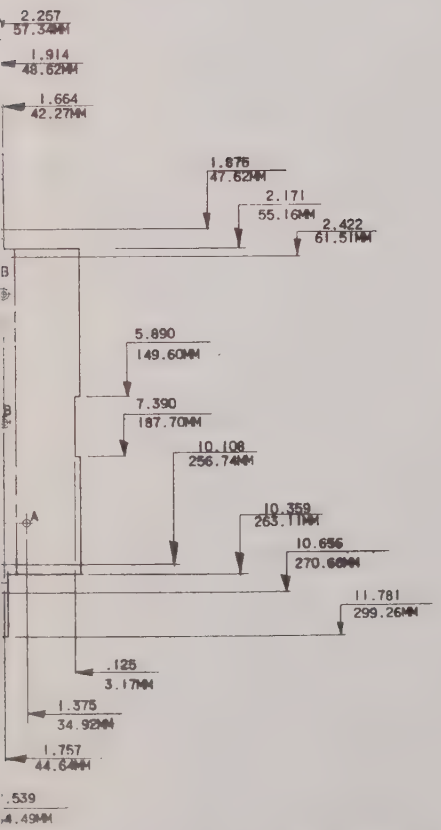
SIZE D NUMBER 0041-13-101 REVISION 1

SHEET 1


11
10
9
8
7
H
G
E
D
C
B
A
16.796 +.000 -.015
426.61MM +.00MM -.38MM
19.765
502.03MM
19.640
498.85MM
17.851
453.41MM
17.507
444.69MM
10.100
256.55MM
9.665
245.49MM
2.265
57.53MM
3.359
85.31MM
6.546
166.26MM
8.640
219.45MM
10.295
260.73MM
12.032
305.61MM
17.226
437.54MM
18.008
457.40MM
14.038
356.57MM
5.726
145.45MM
18.101
459.76MM
18.390
467.10MM
A
B

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	---	9-22-77	SEN





OCT 22 1979

2. DO NOT ETCH OR IRIDITE, SPOT WELDING REQUIRED.

1. ALL DIMENSIONS IN "MM" ARE ±.38"MM" UNLESS OTHERWISE SPECIFIED.

NOTES

REPAIR

HOLE SCHEDULE			
HOLE	SIZE	NO REQ	REMARKS
A	1/8	6	TOOLING HOLES
B	3/16	8	6-32 PEMS
C			
D			
E			
F			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

ALL TOLERANCES ARE ± .015

ALL BENDS ARE 90° ± ½°

BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD

BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE: PANEL SUPPORT DETAIL

FINISH ~~ETCH AND IRIDITE~~ PAINT — FEDERAL SPEC ~~595~~ COLOR ~~24192~~ R AND S VINYL 8080 WHT

MATERIAL: ALUMINUM ~~5052-H34~~ 3003 H14 .093

~~SCALE=1/1~~

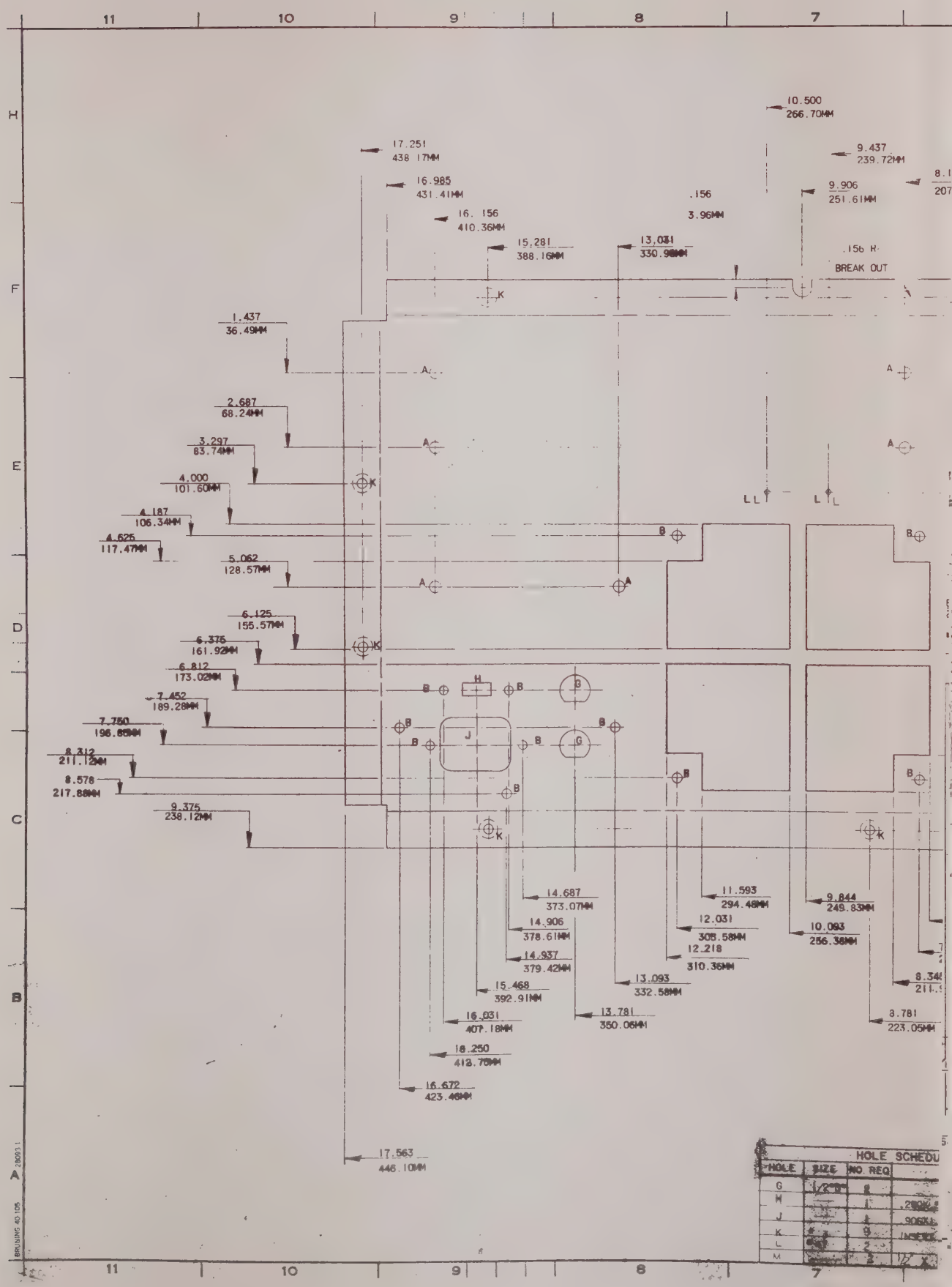
NORTHEAST ELECTRONICS nt

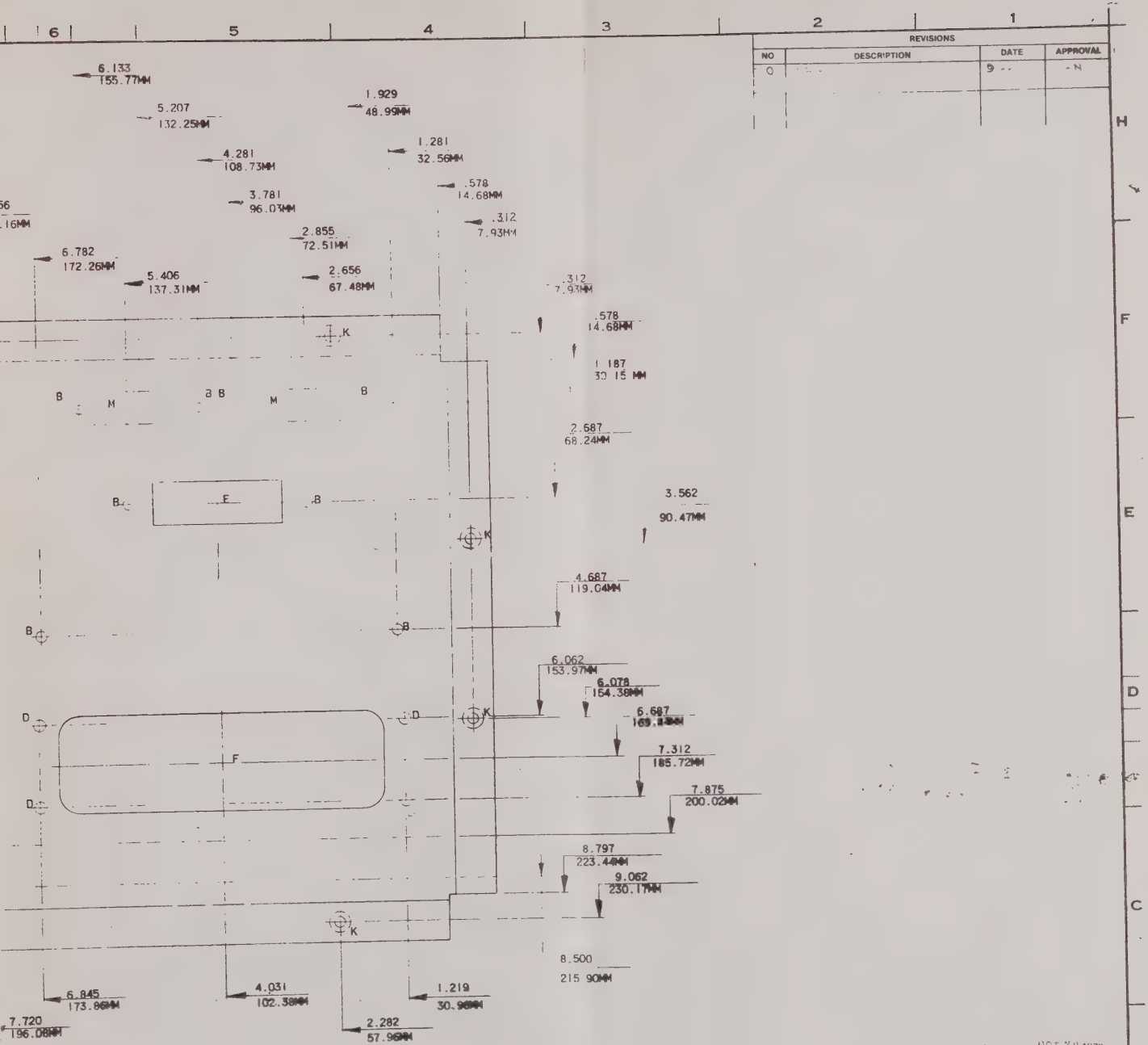
DRAWN [illegible] DATE 9-12-77 SCALE 1/2

CHECKED [illegible] DATE [illegible]

APPROVED S.E.N. DATE 9-12-77

SIZE D NUMBER 0041-13-102 ISSUE 0


11
10
9
8
7
H
F
E
D
C
B
A
10.500
266.70MM
17.251
438.17MM
9.437
239.72MM
16.985
431.41MM
.156
3.96MM
9.906
251.61MM
16.156
410.36MM
15.281
388.16MM
13.031
330.98MM
.156 R
BREAK OUT
1.437
36.49MM
2.687
68.24MM
3.297
83.74MM
4.000
101.60MM
4.187
106.34MM
4.625
117.47MM
5.062
128.57MM
6.125
155.57MM
6.375
161.92MM
6.812
173.02MM
7.452
189.28MM
7.750
196.85MM
8.312
211.12MM
8.578
217.88MM
9.375
238.12MM
14.687
373.07MM
14.906
378.61MM
14.937
379.42MM
15.468
392.91MM
16.031
407.18MM
18.250
463.70MM
16.672
423.46MM
17.563
446.10MM
11.593
294.48MM
12.031
305.58MM
12.218
310.36MM
13.093
332.58MM
13.781
350.06MM
9.844
249.83MM
10.093
256.36MM
8.781
223.05MM
HOLE SCHEDU
HOLE
SIZE
NO. REQ
G
H
J
K
L
M
BRUNING 40-105
28093.1



OCT 22 1979

REPAIR

1. ALL DIMENSIONS IN "MM" ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

NOTES

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
0	---	9 --	- N

HOLE SCHEDULE			
HOLE	SIZE	NO. REQ	REMARKS
A	#13	6	
B	#26	19	
C	---	---	---
D	#19	4	
E	---	1	.687X2.000 RECT.
F	---	1	1.50X5.00 (.312 RADIUS)

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MATL .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE: REAR PANEL DETAIL

FINISH — ETCH AND IRIDITE
PAINT — FEDERAL SPEC. 595 COLOR 36495
~~X AND Y VINYL 6000 WSH~~

MATERIAL: ALUMINUM ~~6061-T6~~ 3003 H14 .093

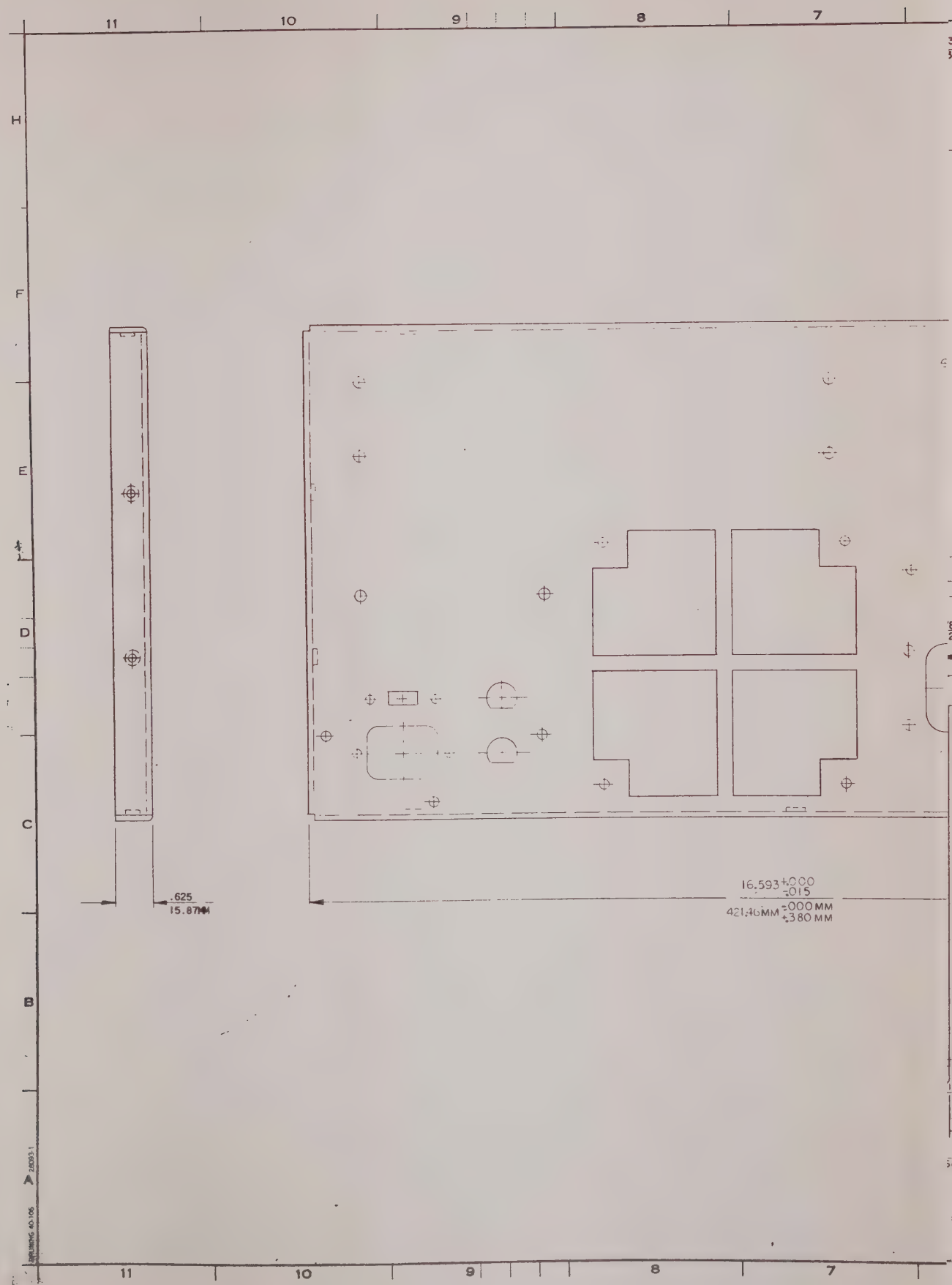
SCREEN PER D0041-13-005

NORTHEAST ELECTRONICS nt

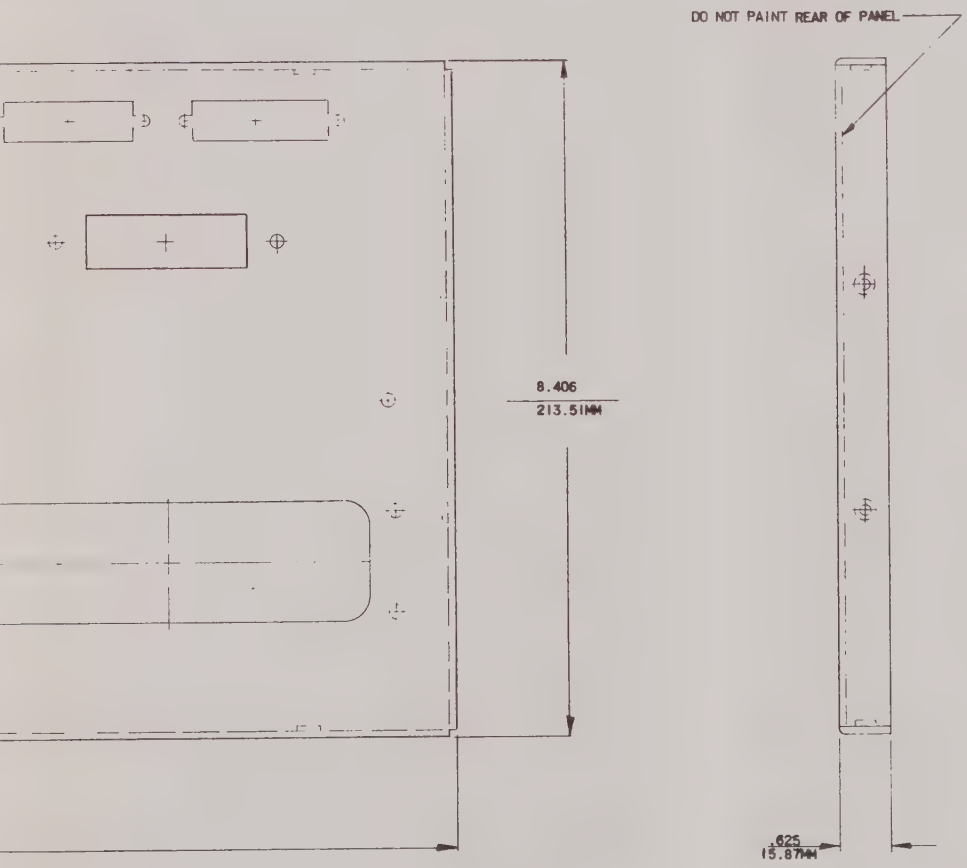
DRAWN [illegible] DATE [illegible] SCALE 1/1
CHECKED [illegible] DATE 7-13-79
APPROVED [illegible] DATE 7-22-79

SIZE D | NUMBER 0041-13-103 | ISSUE 1

SHEET 2 OF 2


11
10
9
8
7
H
F
E
D
C
B
A
.625
15.87MM
16.593 +.000 -.015
421.46MM +.000 -.380 MM

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0		9	



REPAIR

1. ALL DIMENSIONS IN "MM" ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

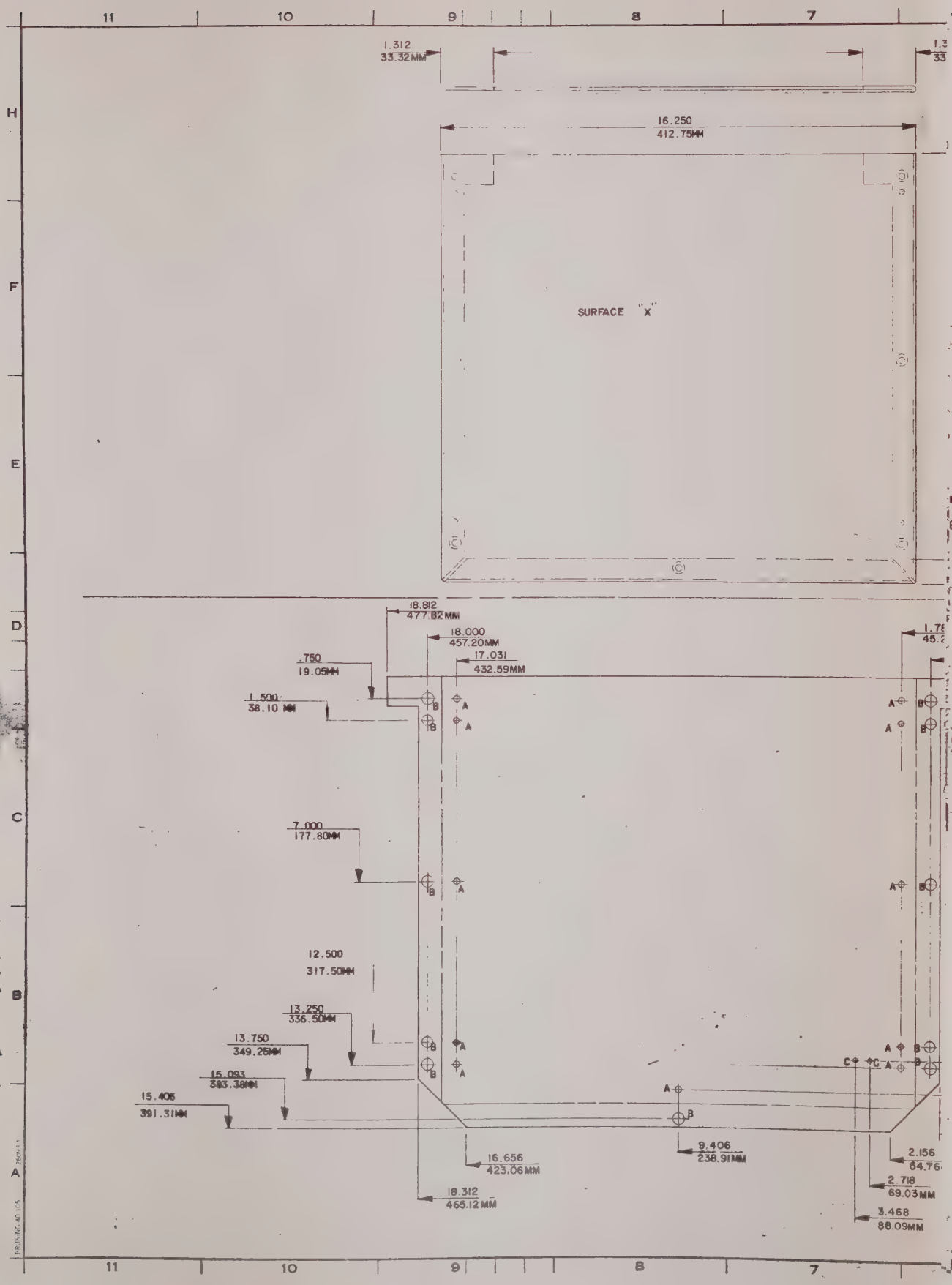
NOTES

SHEET 1 OF 2

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ALL TOLERANCES ARE ± .015 ALL BENDS ARE 90° ± ½° BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	TITLE REAR PANEL DETAIL			NORTHEAST ELECTRONICS nt CONCORD, NEW HAMPSHIRE
	FINISH — ETCH AND IRIDITE PAINT — FEDERAL SPEC. 595 COLOR 26492 ~~R AND S VINYL 8080 WCA~~ SCREEN PER : - - - - - 3 - - -	MATERIAL ALUMINUM 5052 H34 ~~3003 H14~~	.093	DRAWN [illegible] DATE 7/25/77 SCALE — CHECKED [illegible] DATE 7/25/77 APPROVED [illegible] DATE 7-22-77 SIZE D NUMBER 4-13-03 ISSUE 1

SHT. 2
REV 1 1

1/22 1


11
10
9
8
7
H
F
E
D
C
B
A
1.312
33.32MM
16.250
412.75MM
SURFACE "X"
18.812
477.82MM
18.000
457.20MM
17.031
432.59MM
.750
19.05MM
1.500
38.10 MM
7.000
177.80MM
12.500
317.50MM
13.250
336.50MM
13.750
349.25MM
15.093
383.38MM
15.406
391.31MM
16.656
423.06MM
18.312
465.12MM
9.406
238.91MM
2.156
64.76
2.718
69.03MM
3.468
88.09MM

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
1	CHNG C' HOLES Y6 48 (29) .093 EXTEND SIDE FLANGES	2-20-79	

12
32MM

14.625
371.47MM

.812
20.62MM

MM
.812
20.62MM

.500
12.70MM

SURFACE "X"

13.000
330.20MM

14.125
358.77 MM

.500
12.70MM

M

2. DO NOT ETCH OR IRIDITE, SPOT WELDING REQUIRED.

1. ALL DIMENSIONS IN "MM" ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

NOTES

REPAIR
1 22 1979

HOLE SCHEDULE			
HOLE	SIZE	NO REQ	REMARKS
A	19	11	
B	3/8	11	
C		2	125 ± 005 BUTTON(FAR SIDE
D			
E			
F			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± 015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

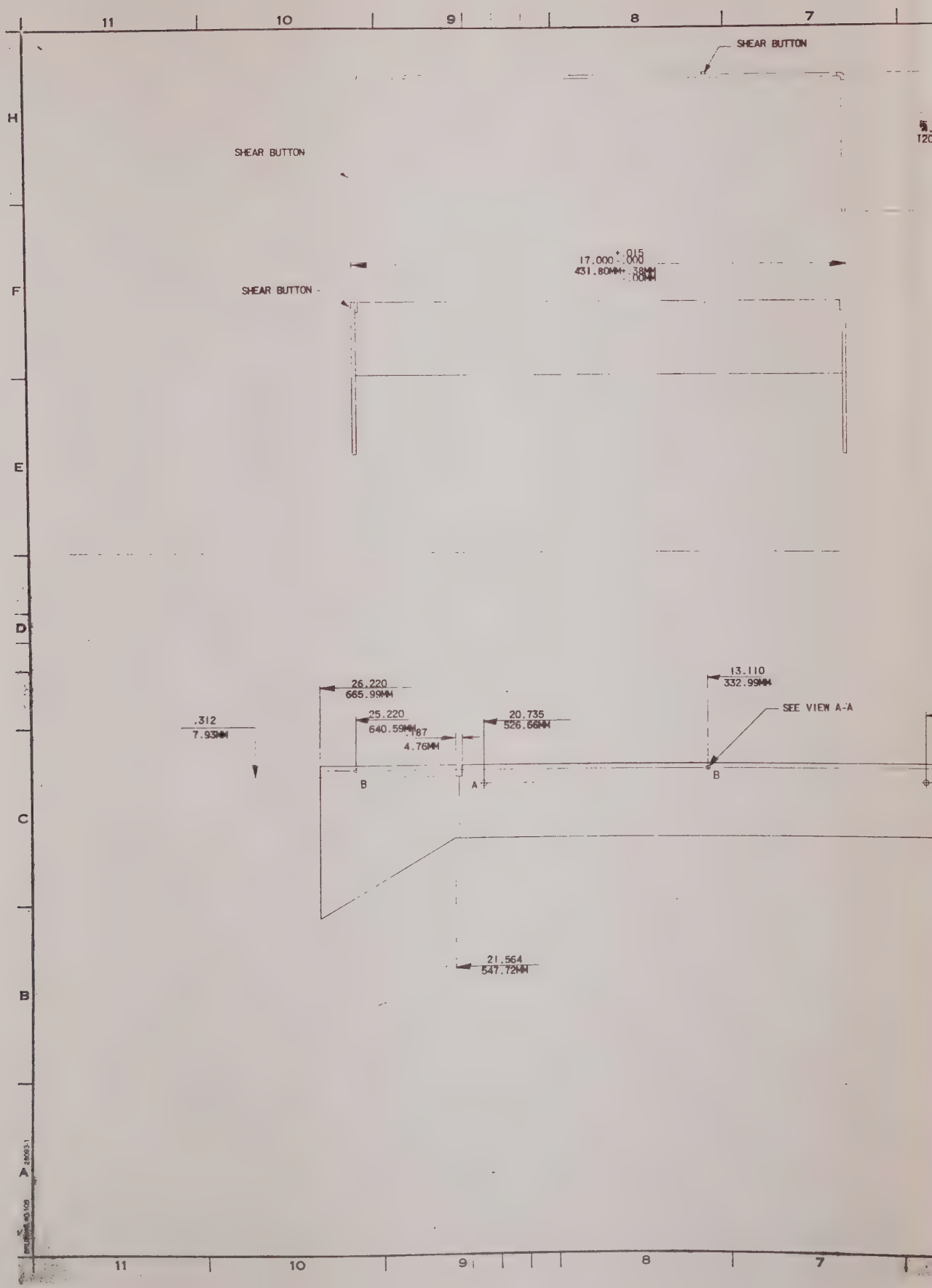
TITLE
INSTRUCTION CARD HOUSING DETAIL

FINISH — ~~ETCH AND IRIDITE~~
PAINT — FEDERAL SPEC ~~595~~ COLOR ~~24087~~
~~R~~ AND S VINYL ~~8052, WB4~~
~~SCREEN PER~~

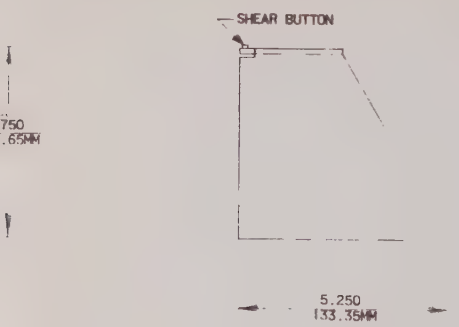
MATERIAL
~~ALUMINUM 6053 H34~~
ALUMINUM 3003 H14
.093

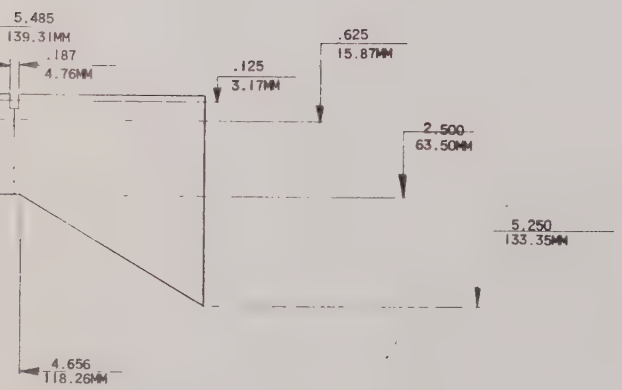
NORTHEAST ELECTRONICS
CONCORD NEW HAMPSHIRE U.S.A.

DRAWN	DATE	SCALE
CHECKED	DATE 7-17-	
APPROVED	DATE 7	
SIZE D	NUMBER	ISSUE 1


11
10
9
8
7
H
F
E
D
C
B
A
SHEAR BUTTON
SHEAR BUTTON
SHEAR BUTTON
17.000 +.015 -.000
431.80MM +.38MM -.00MM
26.220
665.99MM
25.220
640.59MM
.187
4.76MM
20.735
526.66MM
13.110
332.99MM
SEE VIEW A-A
.312
7.93MM
B
A
B
21.564
547.72MM

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9 24-79	JKN
1	ADDED SHEAR BUTTON (#33)	3-10-26	KBH





REPAIR

2. DO NOT ETCH OR IRIDITE, SPOT WELDING REQUIRED.

1. ALL DIMENSIONS IN "MM" ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

NOTES

OCT 22 1979

HOLE SCHEDULE			
HOLE	SIZE	NO. REQ	REMARKS
A	1/8	2	TOOLING HOLES
B	1/8	2	SHEAR BUTTON
C			
D			
E			
F			

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MATL .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE: CASE, TOP DETAIL

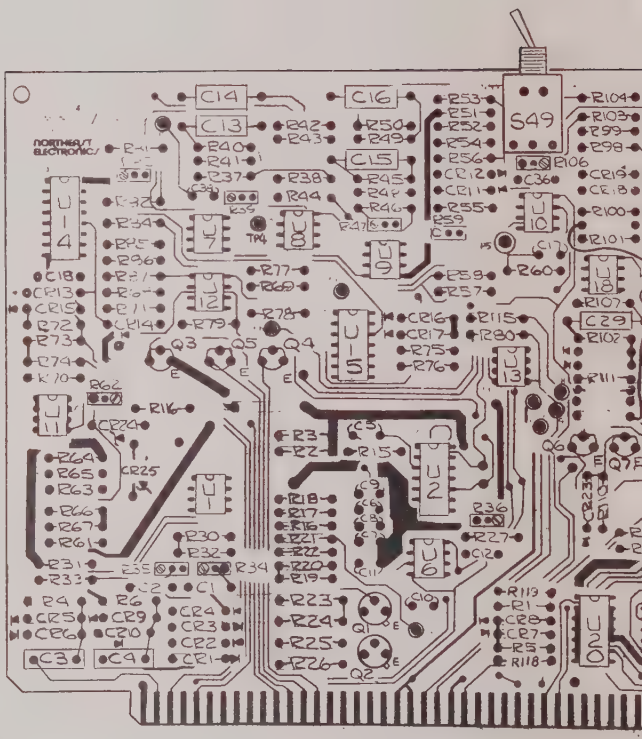
FINISH — ETCH AND IRIDITE
PAINT — FEDERAL SPEC. 595 COLOR 24492
~~H AND S VINYL 8050, WPM~~
SCREEN PER

MATERIAL: ALUMINUM ~~5052-H34~~ 3003 H14 .093

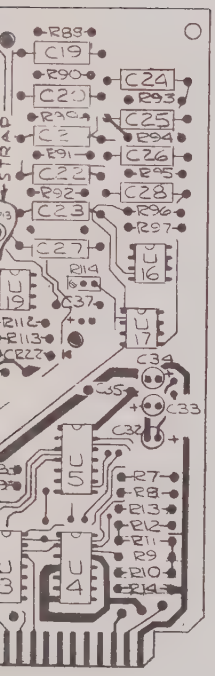
NORTHEAST ELECTRONICS nt
CONCORD, NEW HAMPSHIRE

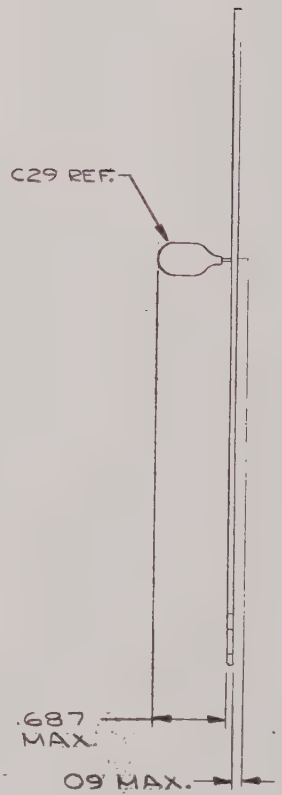
DRAWN — DATE 9/27/77 SCALE 1/2
CHECKED — DATE 9-30-77
APPROVED — DATE 10-22-79

SIZE D NUMBER C04[illegible]-3-109 ISSUE 1


NORTHERN TELECOM
S49
U1
U2
U3
U4
U5
U6
U7
U8
U9
U10
U11
U12
U13
U14
U15
U16
C13
C14
C15
C16
C29
Q1
Q2
Q3
Q4
Q5
Q6
Q7

0	[illegible] ISSUE	9-22-77	SKN
1	ADDED R117-119 %2 (327)	[illegible]	SKN
2	VARIOUS CHGS PER C/O #10 (383)	-9-78	SKN
3	CHANGED R112 C/O #9 (401)	2-6-78	SKN
4	[illegible] FAL SHT. OF ARTWORK [illegible] (425)	5-1978	[illegible]
5	CHNG NOTES 1&2, ARTWORK CHNG TO 9704 %24 (590)	6-1 78	R/K
6	ADDED SHEET 2 C/O 830 (702)	6-28-78	R/K





2. THE FOLLOWING TO BE HAND SOLDERED C13-C16 & C19-C28

1. ◉ DENOTES LARGE MALE QUICK DISCONNECT. 13 PLACES

NOTES

SHEET 1 OF 2

OCT 22 1979

REPAIR

SHEET	1	2
REV	6	0

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .013
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE
MONITOR / TONES DETECTORS BD. ASS'Y 96830

~~FINISH — ETCH AND IRIDITE~~
~~PAINT — FEDERAL SPEC. 595 COLOR 24192~~
~~P AND S VINYL 8050, W24~~

~~MATERIAL~~
~~ALUMINUM~~
~~5052 H34~~
~~3003 H14~~

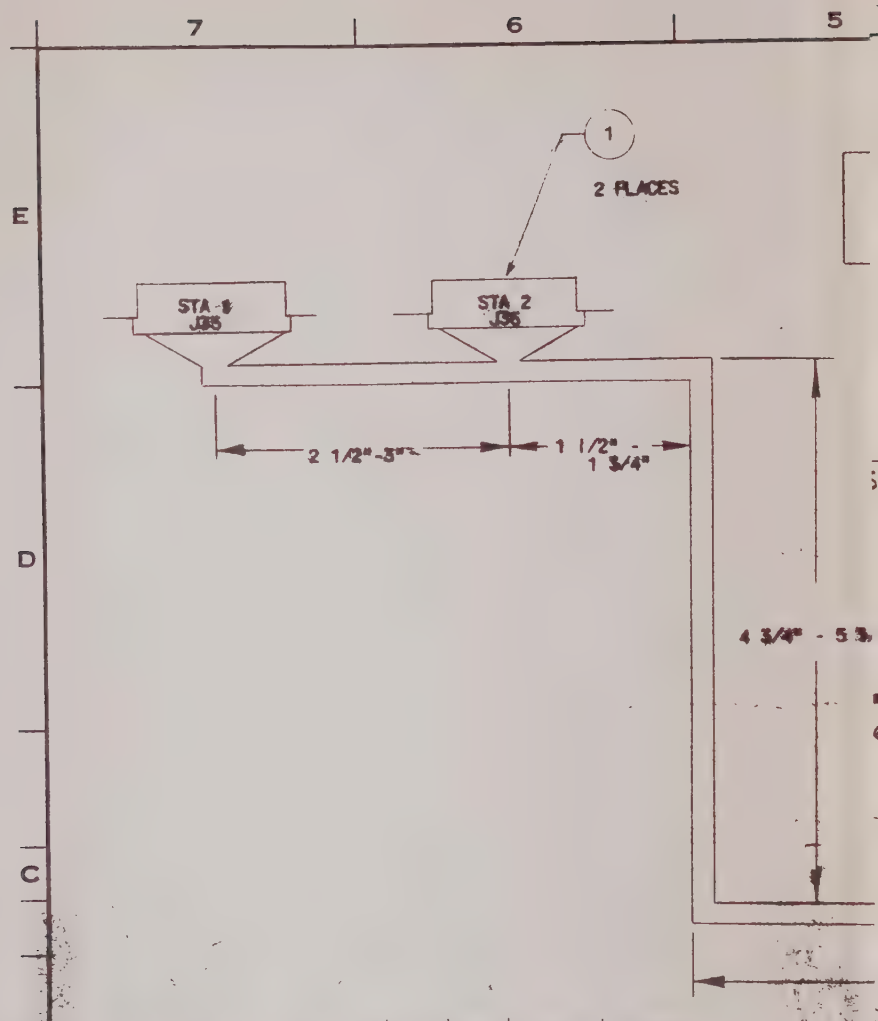
SCREEN PER SCHEMATIC D 0041-13-321

NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN MCF	DATE 3/29/77	SCALE 1/1
CHECKED		DATE 7-13-77
APPROVED SKN		DATE 7-22-77

SIZE C | NUMBER 0041-13-021 | ISSUE

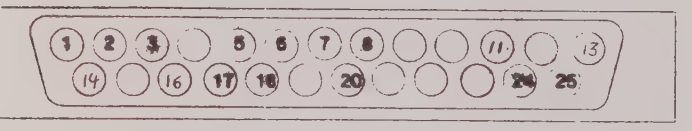
4 3 2 1



COLOR	GA	FROM	TO	STA	STA	LENGTH	MARKER
BLK	26	J35.1	J35.6	1	1	1"	GROUND
[illegible]		J35.7	J35.1	1	2	3 1/2"	GROUND
[illegible]		J35.1	J35.7	2	2	1"	GROUND
BLK		J35.7	P35.4	2	3	17"	GROUND
[illegible]		J35.8	J35.6	1	1	1"	[illegible] CTS
[illegible]		J35.8	J35.8	1	1	1"	REMOTE DSR
[illegible]		J35.8	J35.5	1	2	3 1/2"	REMOTE CD
[illegible]		J35.8	J35.5	2	2	1"	AUX CTS
[illegible]		J35.8	J35.6	2	2	1"	AUX DSR
[illegible]		J35.6	J35.8	2	2	1"	AUX CD
[illegible]		J35.8	P35.15	2	3	17"	AUX CD
GRN		J35.11	P35.19	1	3	20"	REMOTE KB+
YEL		J35.13	P35.13	1	3	20"	REMOTE KB-
BLU		J35.2	P35.3	1	3	20"	REMOTE EIA REC
BRN		J35.14	P35.2	1	3	20"	REMOTE PT+
ORG		J35.16	P35.5	1	3	20"	REMOTE PT-
V10		J35.3	P35.7	1	3	20"	REMOTE EIA XMIT
[illegible]		J35.11	P35.20	2	3	17"	AUX KB+
[illegible]		J35.13	P35.9	2	3	17"	AUX KB-
[illegible]		J35.2	P35.1	2	3	17"	[illegible] EIA REC

BRUNING 40-107 28093-2

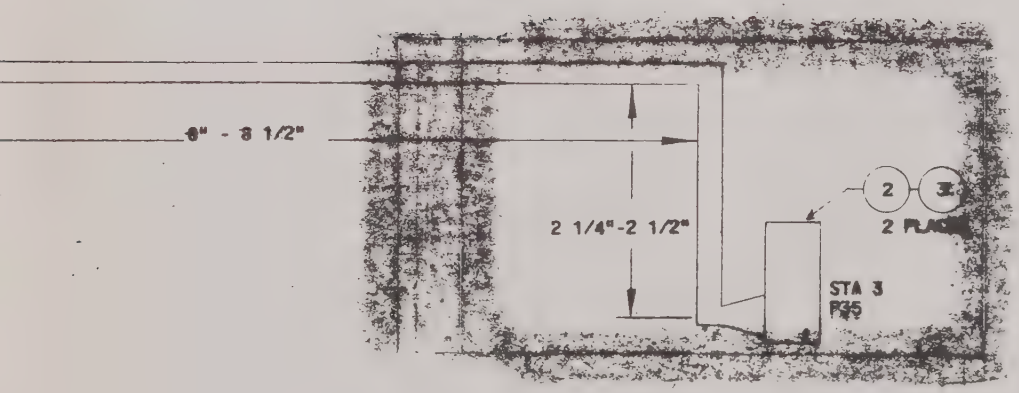
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
1	NEW WIRING 9639 (758)	9-7-79	1-5-79
2	MOVE STA 3 to 54 (148)	9-2-79	9-2-79
3	PR 1146, 86340390 TO 86340391 C/O 7 (443) Dp.	8-30-79	RMD.



WIRING END VIEW
STA 1 - 2

20	19
18	17
16	15
14	13
12	11
10	9
8	7
6	5
4	3
2	1

WIRING END VIEW
STA 3

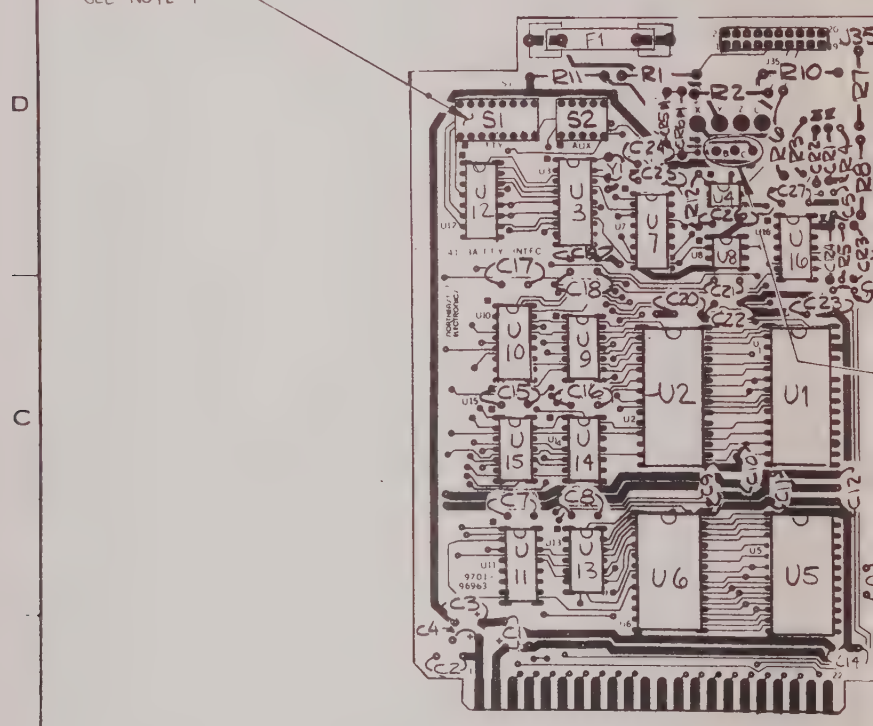


OCT 22 1979
REPAIR

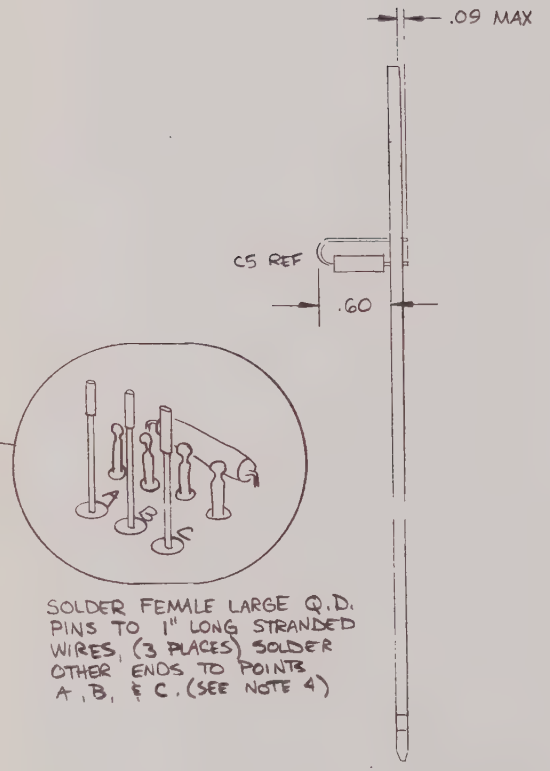
NOTES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ALL TOLERANCES ARE ± .015 ALL BENDS ARE 90° ± ½° BEND RADIUS AS FOLLOWS MATL .09 OR LESS, 1/64 RAD MATL .128, 3/32 RAD BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	TITLE P [illegible] CABLE FINISH — ETCH AND IRIDITE PAINT — FEDERAL SPEC. [illegible] COLOR 25472 [illegible] VINYL [illegible] SCREEN PER SCHEMATIC	MATERIAL ALUMINUM 5052 H34 5056 H34 85 0041-13-365	NORTHEAST ELECTRONICS Int DRAWN [illegible] DATE DEC 7 78 SCALE CHECKED DATE APPROVED [illegible] DATE 1-3-79 SIZE C NUMBER 0041-13-065 ISSUE 3

4 3 2 1


SEE NOTE 1
F1
R11
R1
R2
R10
S1
S2
U3
U7
U16
U10
U9
U2
U1
U15
U14
U11
U13
U6
U5
U12
C17
C18
C15
C16
C7
C8
C1
C2
C3
C4
C14

NO	DESCRIPTION	DATE	APPROVAL
5	ARTWORK CHG S/O 64 (366) PPL	8-30-79	R. Aker
6	P/L CHNG S/O 65 (435) RBJ	9-12-79	J.J.C.



SOLDER FEMALE LARGE Q.D. PINS TO 1" LONG STRANDED WIRES, (3 PLACES) SOLDER OTHER ENDS TO POINTS A, B, & C. (SEE NOTE 4)

4. CONNECT JUMPERS: A TO X
   B TO Y
   C TO Z
3. MOUNT CR6 1/4" ABOVE BOARD & INSULATE WITH SHRINK TUBING.
2. ⦿ DENOTES LARGE QUICK DISCONNECT PINS
1. SWITCHES TO BE INSTALLED WITH "ON" POSITION TOWARDS CARD EDGE FINGERS.

OCT 22 1979 **REPAIR**

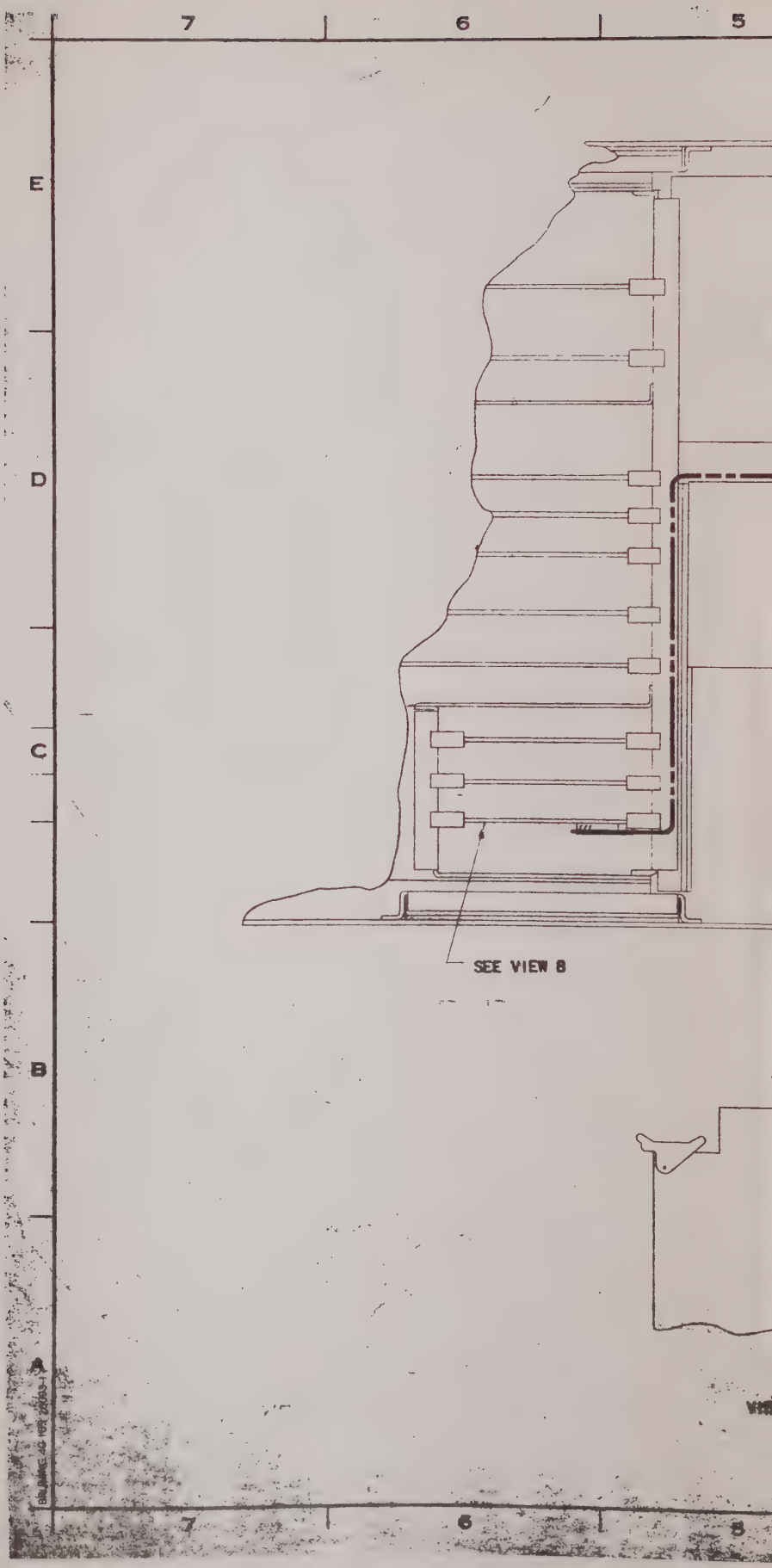
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90°
BEND RADIUS AS FOLLOWS
MATL .09 OR LESS 1/64 R.
MATL .125 1/32 RAD
BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES
WITH FINE GRIT

TITLE
41-3A TTY INTERFACE ASSY
96963

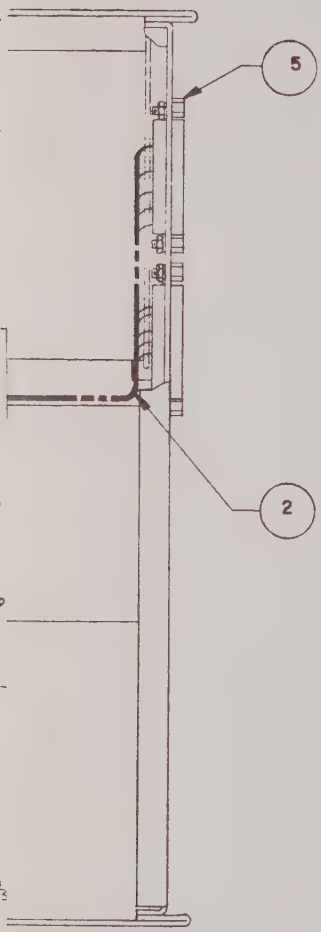
int

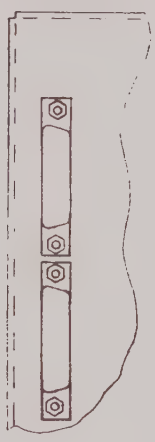
DRAWN CHURCHILL DATE 8-27-79 SCALE —
DATE 9-08-27
DATE

0041-13-064 ISSUE 6

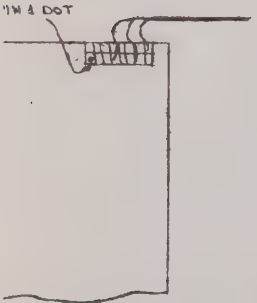

7
6
5
E
D
C
B
A
SEE VIEW 8

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE RELEASED	12-27-77	SEN
1	NEW TTY CARD 5639-798		





CONNECTOR FLANGE GOES ON EXTERIOR SURFACE OF REAR PANEL



OCT 22 1979

REPAIR

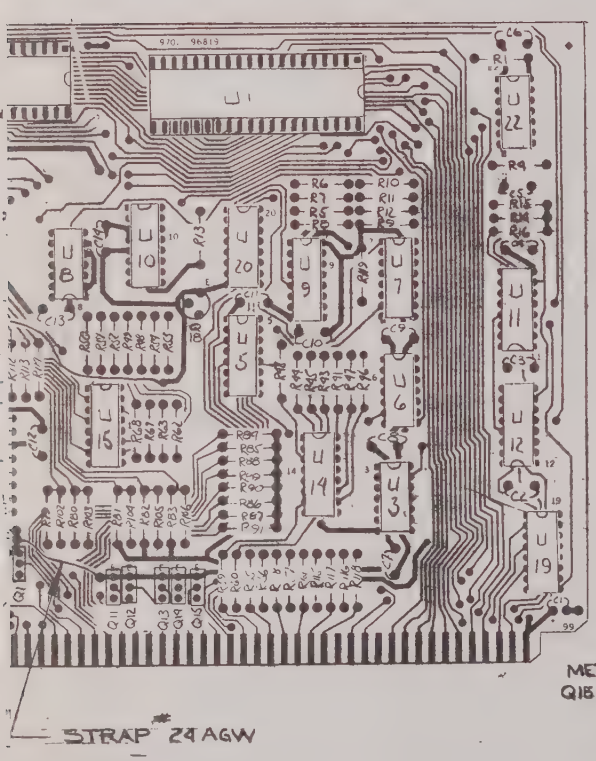
NOTES

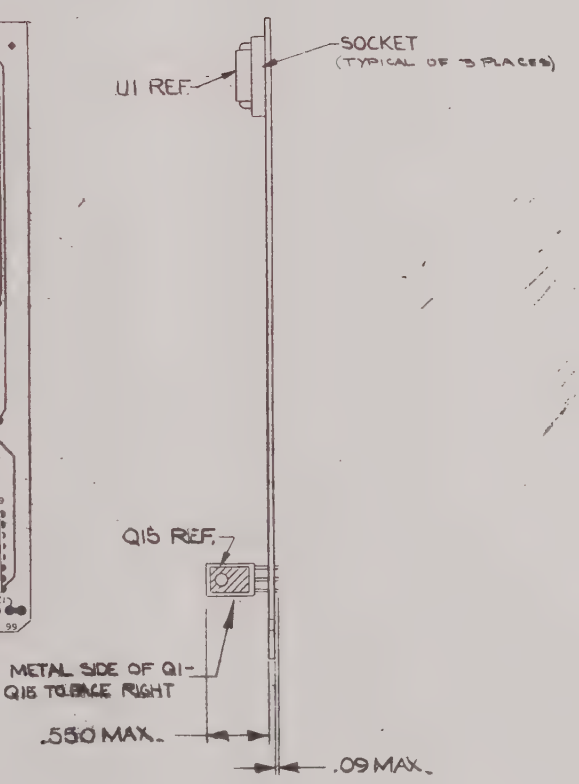
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES ALL TOLERANCES ARE ± .015 ALL BENDS ARE 90° ± ½° BEND RADIUS AS FOLLOWS MATL .09 OR LESS 1/64 RAD MATL .125, 3/32 RAD BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH ZONE GRIT	TITLE 41-3A TTY INSTALLATION FINISH — ETCH AND IRIDITE PAINT — FEDERAL STD. 595 COLOR 24492 R AND S VINYL 595B, W24 SCREEN PER	MATERIAL ALUMINUM 5052 H34 3003 H14	NORTHEAST ELECTRONICS nt DRAWN [illegible] DATE 12-22-77 SCALE ¾ CHECKED DATE APPROVED S EN DATE 12-22-77 SIZE C NUMBER 0041-13-069 ISSUE

7
6
E
D
C
B
A
STRAP #24 AGW
(3 PLACES)
U2
U13
Q16
Q17
BRUNING 40-107 28093-2
7
6
5

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
4	A/W CHNG %32 (700)	8-31-78	mal
5	ADD STRAPS FROM U16.8, 17.8, 18.8 TO GRD. S10 99 (59) PDL	2-20-79	A/L
6	ADD STRAP %52 (123) PDL	4-6-79	mal
7	REMOVE STRAP %60 (269) PDL	5-24-79	J.F.E.

CUT BETWEEN PAD & TRACK





REPAIR
OCT 22 1979

NOTES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE: DISPLAY I/O BOARD ASSY 96819

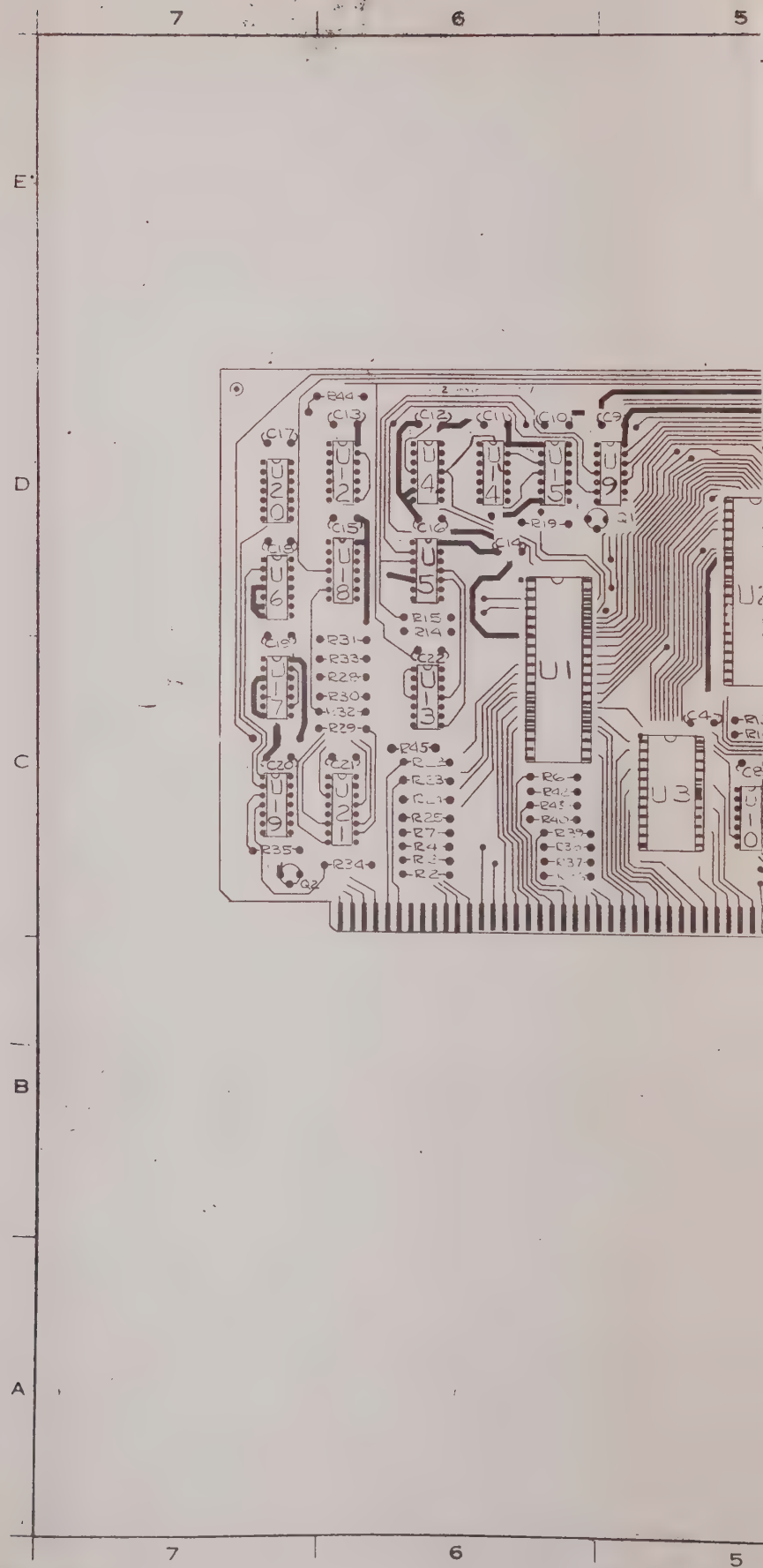
~~FINISH — ETCH AND IRIDITE~~
~~PAINT — FEDERAL SPEC. STD COLOR 24172~~
~~S AND S VINYL 0388 W24~~
~~SCREEN PER~~

~~MATERIAL~~
ALUMINUM
5052-H34
3003-H14

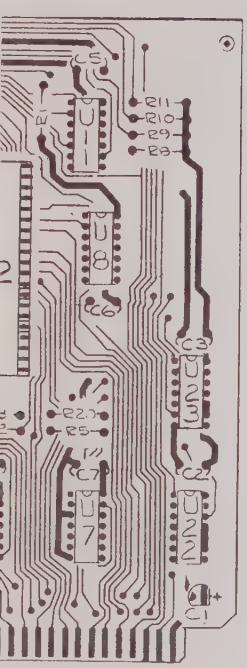
NORTHEAST ELECTRONICS Int

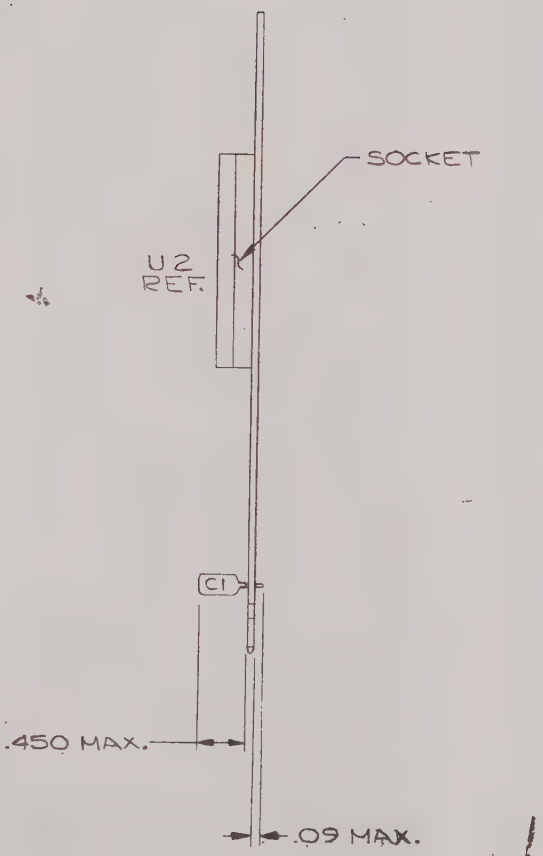
DRAWN MP	DATE 10/15	SCALE —
CHECKED CRG		DATE 8-31-78
APPROVED CRG Mal.		DATE 8-31-78

SIZE C | NUMBER 0041-13-024 | ISSUE 7


7
6
5
E
D
C
B
A
U1
U3
R44
C13
C12
C11
C10
C9
C17
U12
U14
U15
U9
C15
C16
C14
U18
U16
U5
R19
R15
R14
C18
U17
U13
R31
R33
R28
R30
R32
R29
C22
R45
C20
C21
U19
U21
R23
R25
R7
R4
R3
R2
R35
R34
Q2
R6
R42
R43
R40
R39
R37
C4
U10

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	CHNG REF DESG. PER 404 (298)	10-31-77	SKN
2	PL CHG. PER C/O #10 (383)	9-9-78	SKN





OCT 22 1979

REPAIR

NOTES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS
MAT'L .09 OR LESS, 1/64 RAD
MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES
WITH FINE GRIT

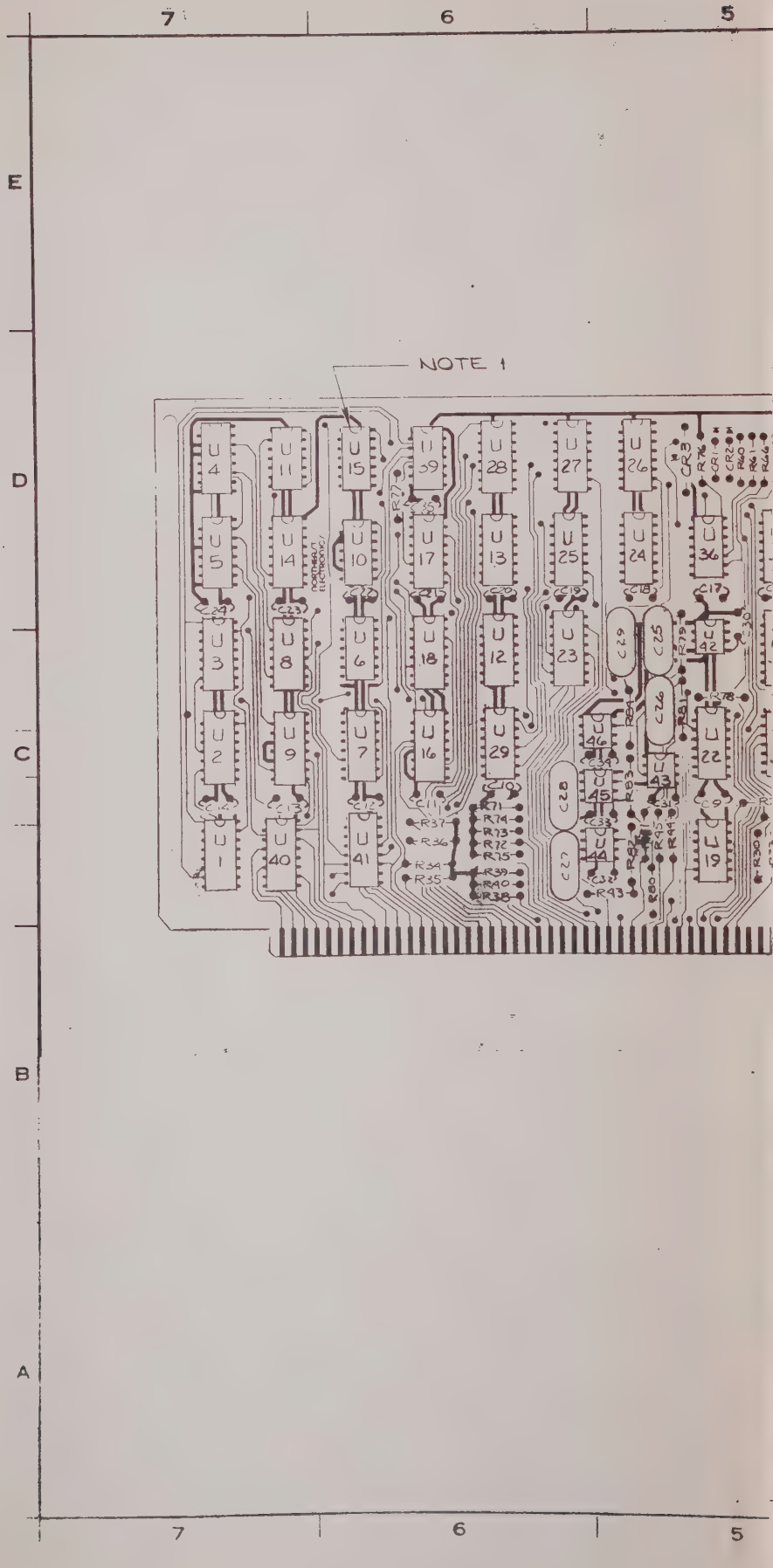
TITLE
SYSTEM I/O BD.
96818

~~FINISH — ETCH AND IRIDITE~~
~~PAINT — FEDERAL SPEC. STD. COLOR 26492~~
~~R AND S VINYL 8050, W24~~
~~MATERIAL~~
~~ALUMINUM~~
~~5052 H34~~
~~3003 H14~~
~~SCREEN PER~~ Summit 0041-13-323

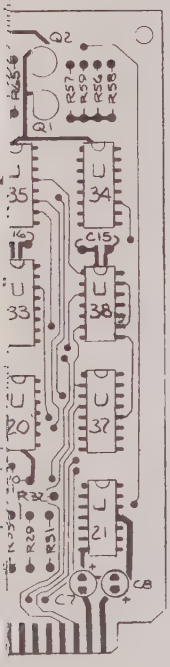
NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE U.S.A.

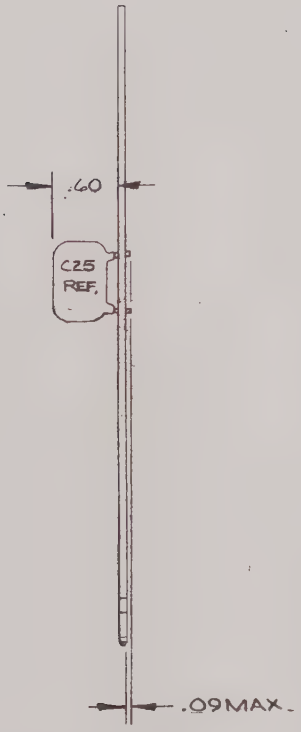
DRAWN	MCF	DATE 3/19/77
CHECKED	DOC	DATE 7-13-77
APPROVED	SKN	DATE 7-22-77

SIZE	NUMBER	ISSUE
C	0041-13-023	2


7
6
5
E
D
C
B
A
NOTE 1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
3	REV. P.C. BOARD % 40 (826)	1-8-79	
4	CHNG C27 TO C35 % 53 (40)	4-4-79	
5	ADD STRAP % 55 (155)	4-26-79	
6	A/W CHNG % (266)	5-29-79	





OCT 22 1979

REPAIR

NOTES
1. IF UIS IS A METAL PACKAGE, USE 1/16" GLASS BEADS BETWEEN PKG. AND P.C. BD.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS
MAT'L .09 OR LESS, 1/64 RAD
MAT'L .128, 3/32 RAD
BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES WITH FINE GRIT

TITLE
DIAL GEN / TIMER BD. ASSY 96824

FINISH — ETCH AND IRIDITE
PAINT — FEDERAL SPEC. 595 COLOR 26492
R AND S VINYL B060, W24
SCREEN PER SCHEM. 0041-13-322

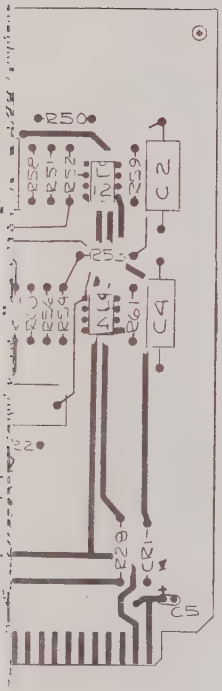
MATERIAL
ALUMINUM 5052 H34 3003 H14

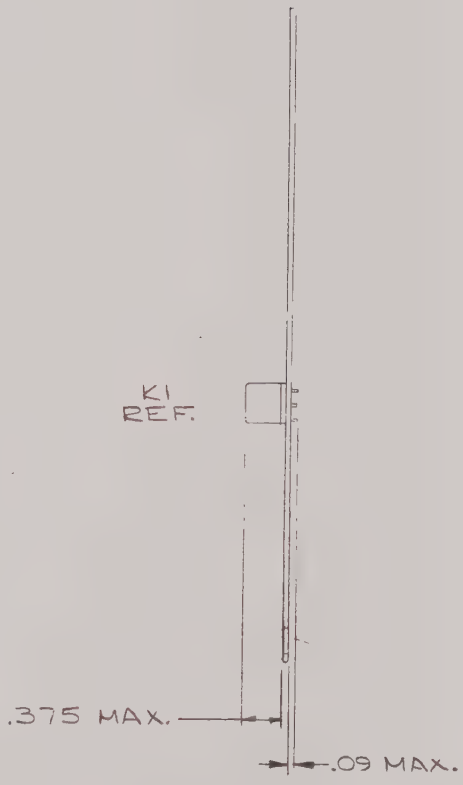
NORTHEAST ELECTRONICS
CONCORD NEW HAMPSHIRE

DRAWN	DATE	SCALE
CHECKED CDB	DATE 1-5-79	
APPROVED	DATE 5/25/79	
SIZE C	NUMBER 0041-13-028	ISSUE 6

5

REVISIONS			
	DESCRIPTION		APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	ARTWORK CHNG. C/O 13 (391)	1-17-78	R.J.L.





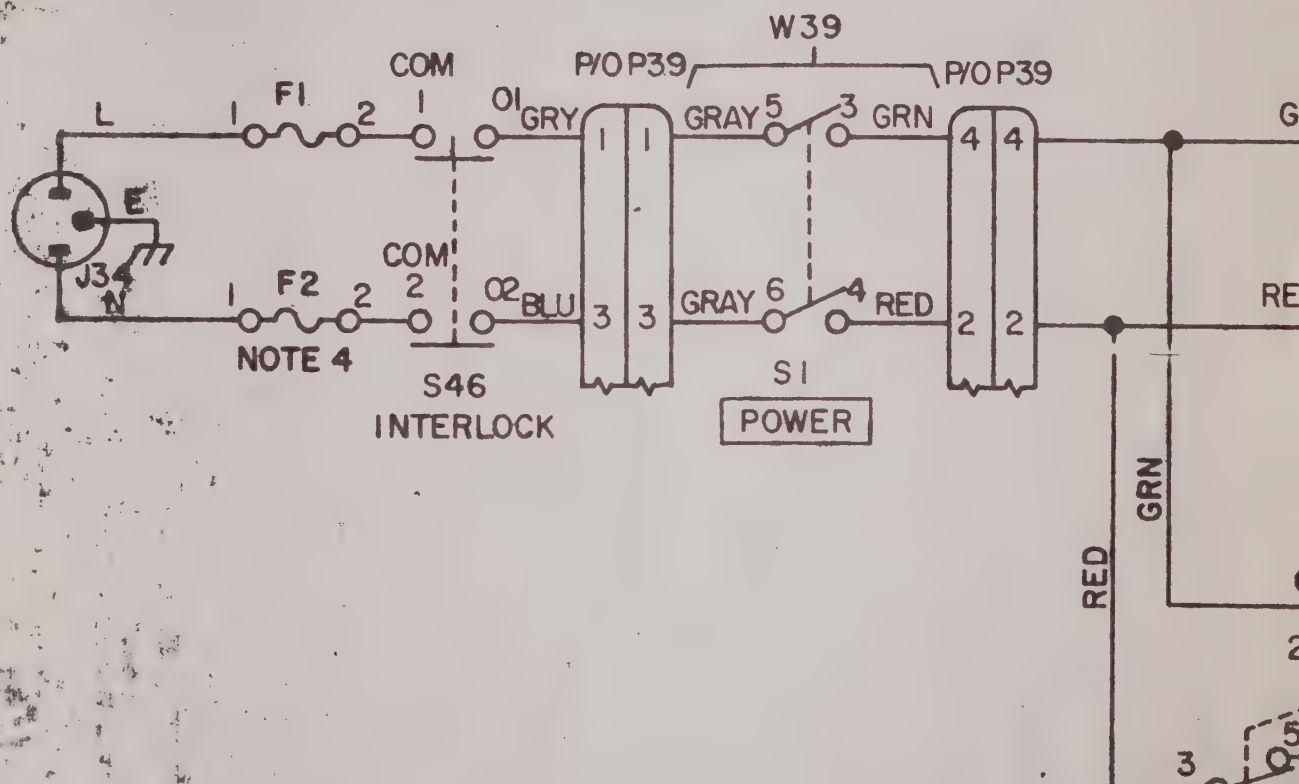
OCT 22 1979

REPAIR

NOTES

1. SOLDER MASK C1-4, HAND SOLDER AFTER WAVE

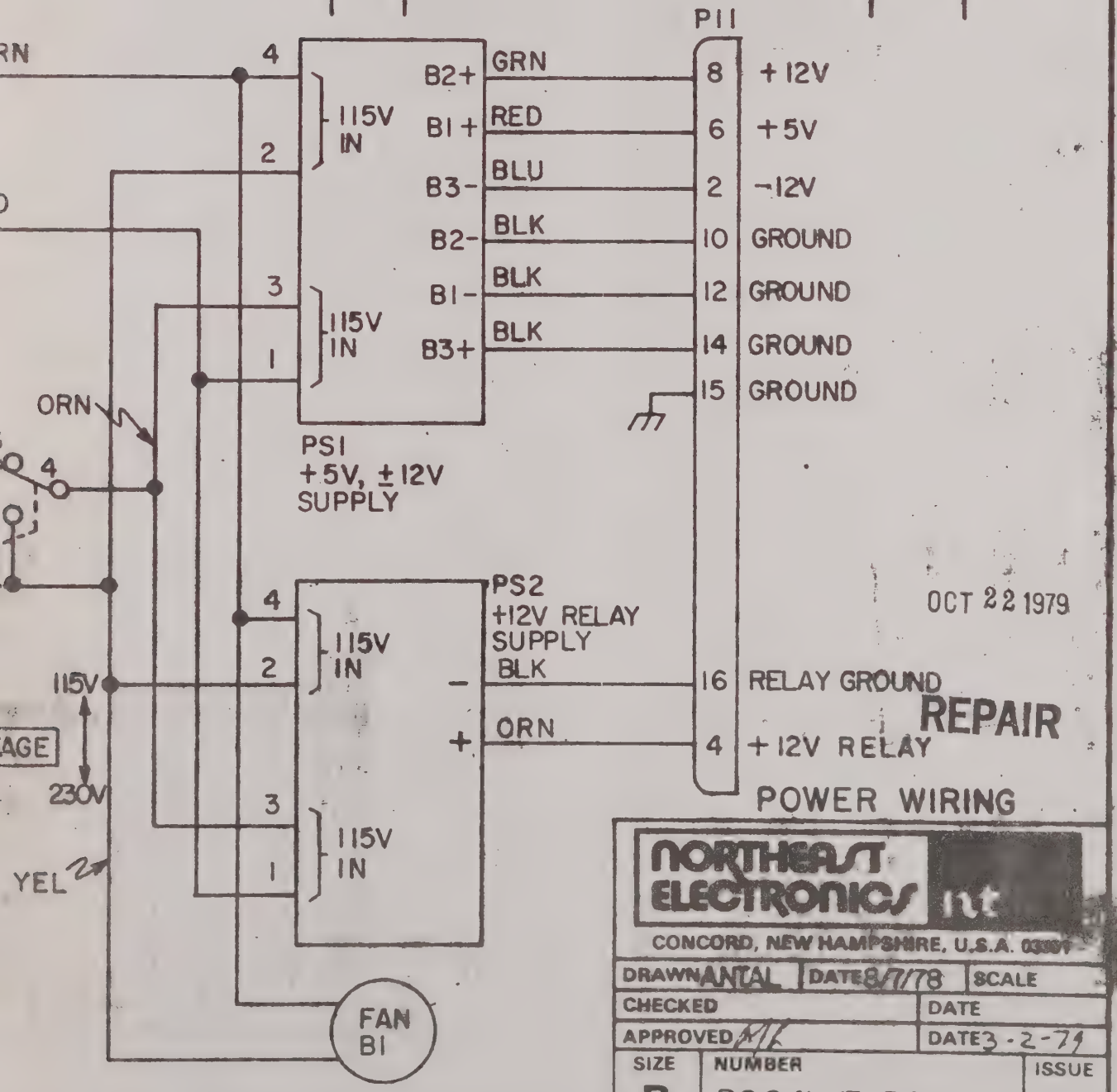
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: DIGITAL TT/MF GEN. BD. ASS'Y 96825	NORTHEAST ELECTRONICS, CONCORD, NEW HAMPSHIRE, U.S.A.	
ALL TOLERANCES ARE ± .015			
ALL BENDS ARE 90° ± 1/2°			
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS 1 64 RAD MAT'L .125, 3 32 RAD	~~FINISH — ETCH AND IRIDITE~~ ~~PAINT — FEDERAL SPEC 595 COLOR 26492~~ ~~P AND S VINYL 8050, W24~~	~~MATERIAL~~ ~~5052 H34~~ ~~3003 H14~~	DRAWN MCF DATE 3/24/77 SHEET 1/1
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	~~SCREEN PER~~ SCHEMATIC D 0021-13-320		CHECKED DPL DATE 7-3-77
			APPROVED SKN DATE 9-22-77
			SIZE C NUMBER 0041-13-020



NOTES

1. W39 IS PART OF MOTHERBOARD.
2. S1 IS PART OF FRONT PANEL.
3. ALL OTHER COMPONENTS REPORT TO REAR PANEL.
4. F1 AND F2 ARE 2A SB FOR 115V OPERATION AND 1A SB FOR 230V OPERATION.

NO.	DESCRIPTION	DATE	APPROVAL
1	REDRAWN C/O 42 (932)	3-2-79	



OCT 22 1979

REPAIR

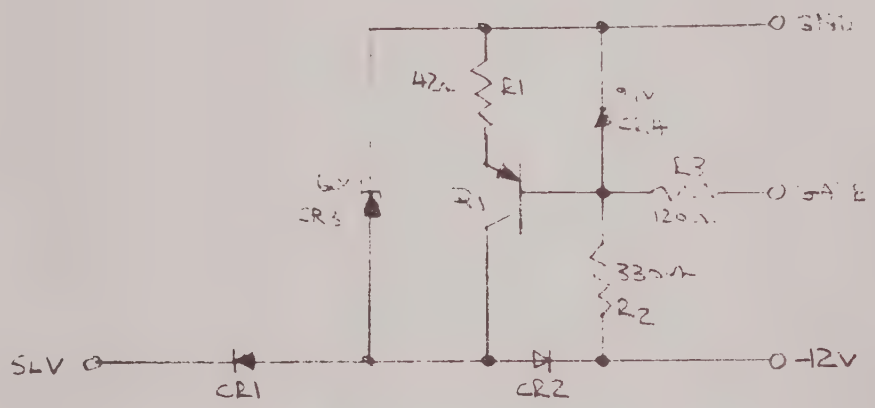
POWER WIRING

NORTHEAST ELECTRONICS int

CONCORD, NEW HAMPSHIRE, U.S.A. 03301

DRAWN ANTAL	DATE 8/7/78	SCALE
CHECKED		DATE
APPROVED		DATE 3-2-79

SIZE	NUMBER	ISSUE
B	B0041-13-309	1



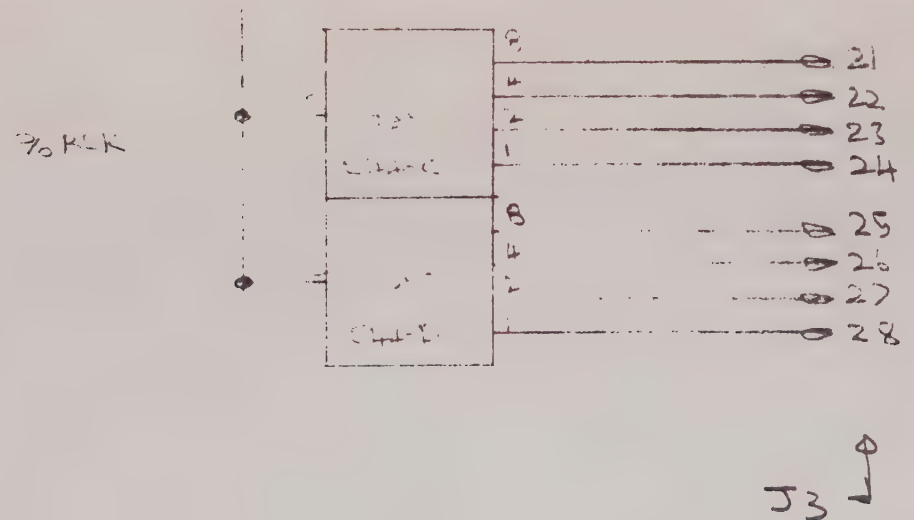
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

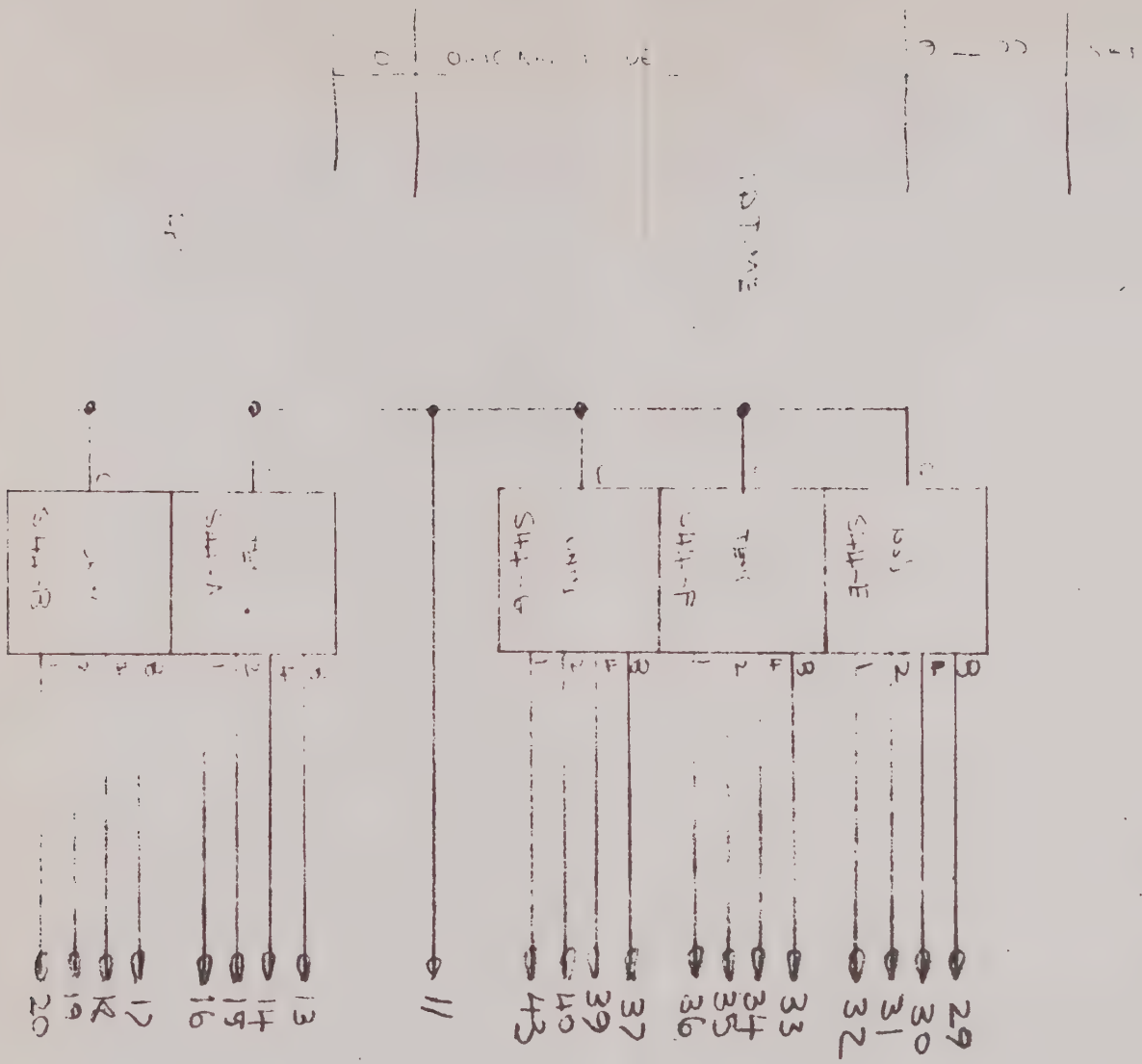
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL

OCT 22 1979

REPAIR

TITLE: 41-3A SLEEVE HOLD CKT -76641-	NORTHEAST ELECTRONICS CORPORATION CONCORD, N.H., U.S.A.	
~~FINISH — ETCH AND IRIDITE~~	MATERIAL	DRAWN SKN DATE 3-12-77 SCALE —
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34~~ ~~3003 H14~~	CHECKED SKN DATE 7-21-77
~~R AND S VINYL 8050, W24~~		APPROVED [illegible] DATE 9-22-77
~~SCREEN PER~~ B-204 [illegible]		SIZE B NUMBER 0241-0-22? ISSUE [illegible]


3'0 R.L.K
21
22
23
24
25
26
27
28
J3



OCT 22 1979

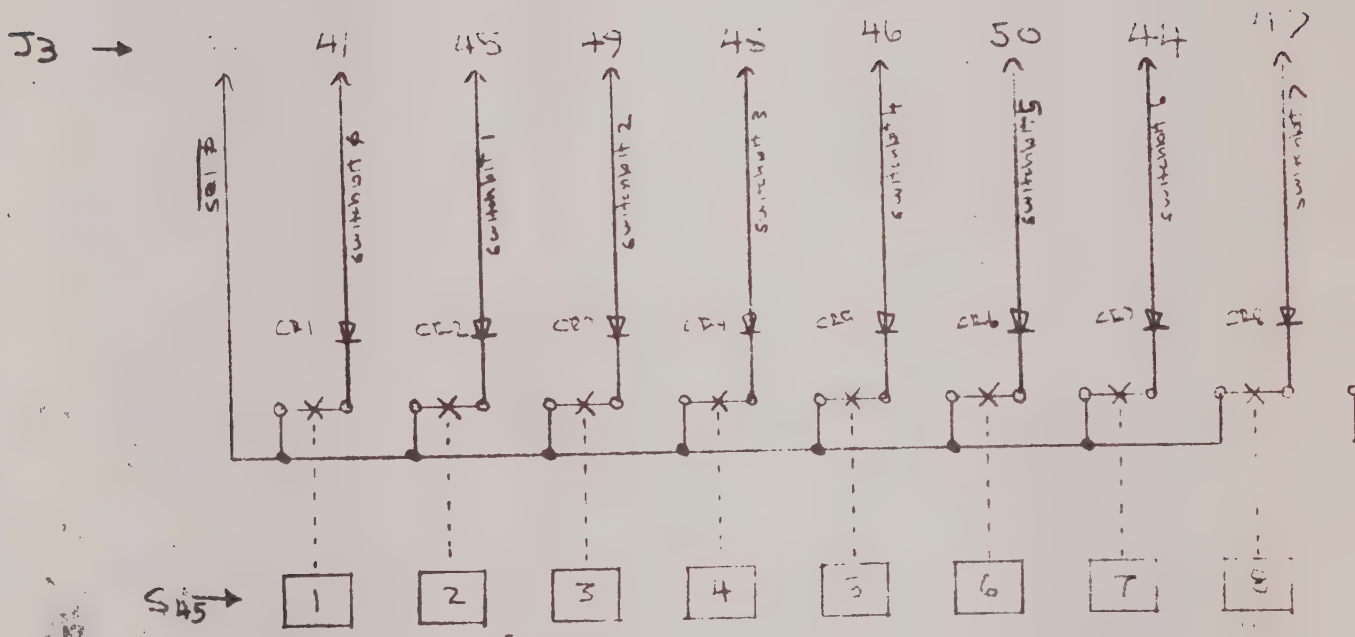
41-3A KEYBOARD

REPAIR

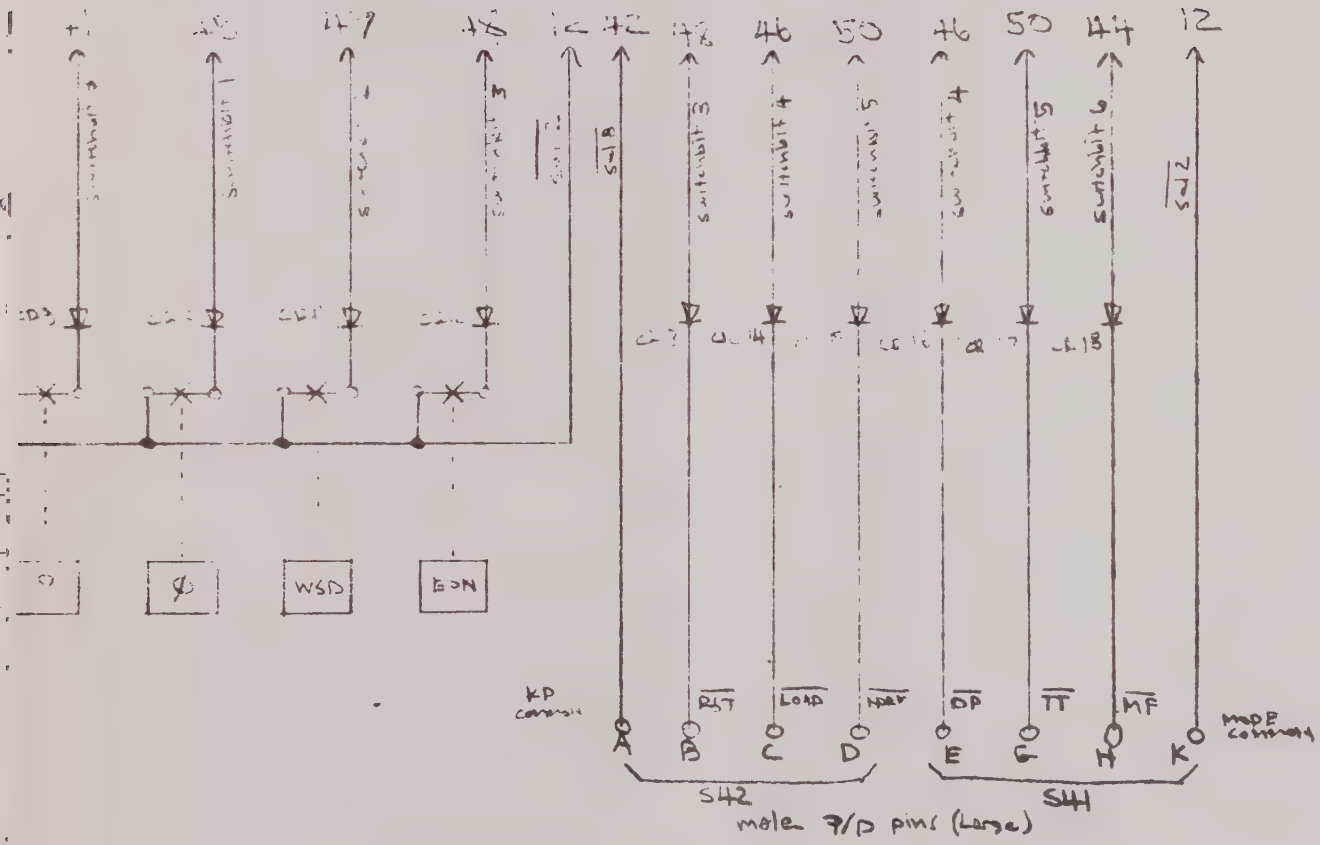
B-0041-13-317

SHT 2 OF 2

7-22-77 SKN


J3
41
45
49
48
46
50
44
47
SW A
CR1
CR2
CR3
CR4
CR5
CR6
CR7
CR8
S45
1
2
3
4
5
6
7
8

0	ORIGINAL ISSUE	9-22-77	SKN



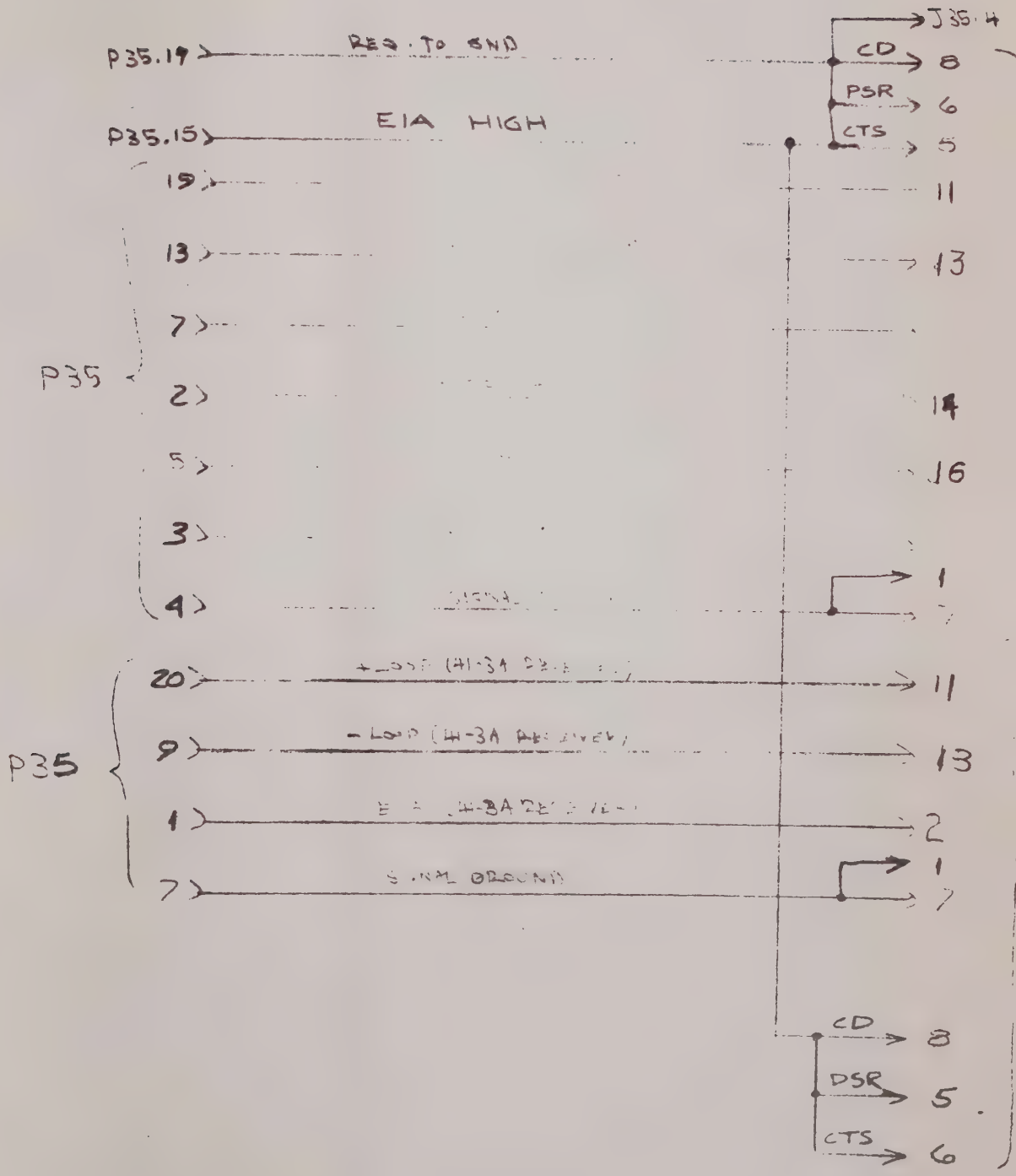
OCT 22 1979

41-3A KEYBOARD **REPAIR**

B-0044-13-317 REV 0

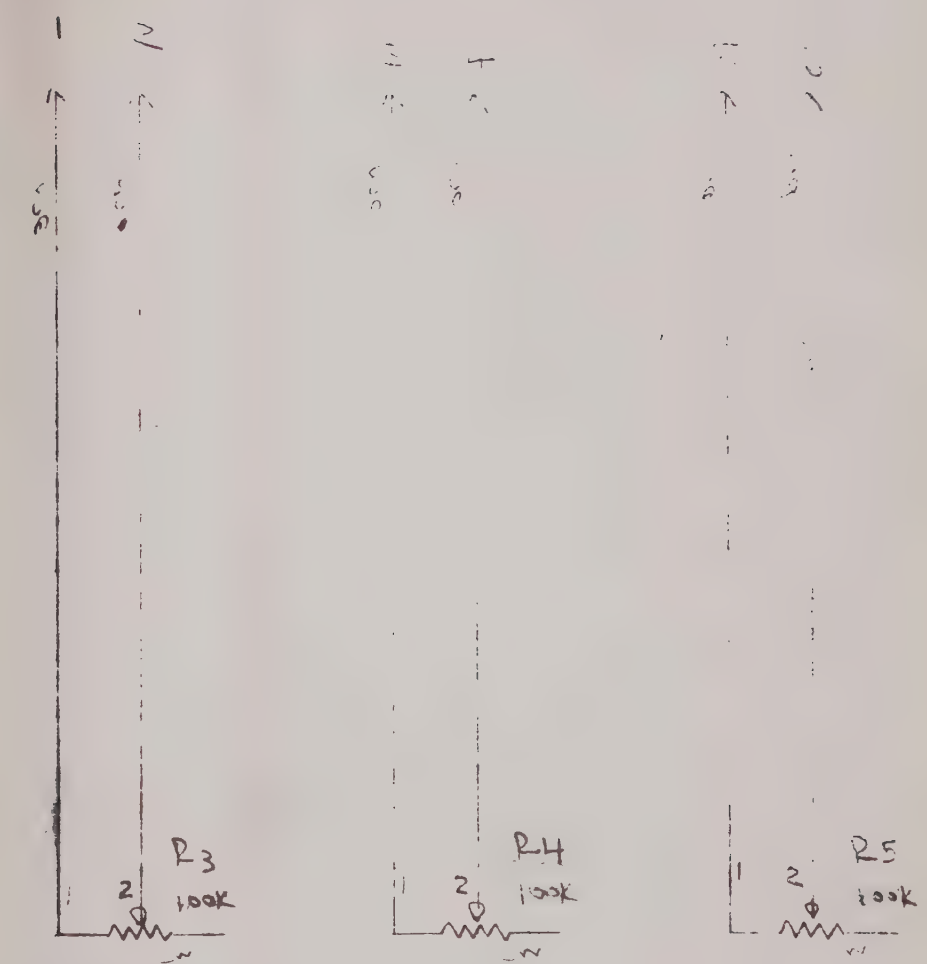
SH 152

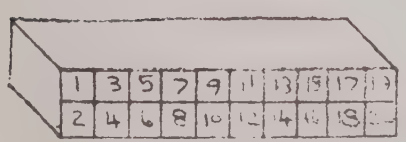
9-22-77 SKN


P35.19
REQ. TO SND
P35.15
EIA HIGH
19
13
7
P35
2
5
3
4
20
9
P35
1
7
J35-4
CD
8
PSR
6
CTS
5
11
13
14
16
1
7
11
13
2
1
7
CD
8
DSR
5
CTS
6

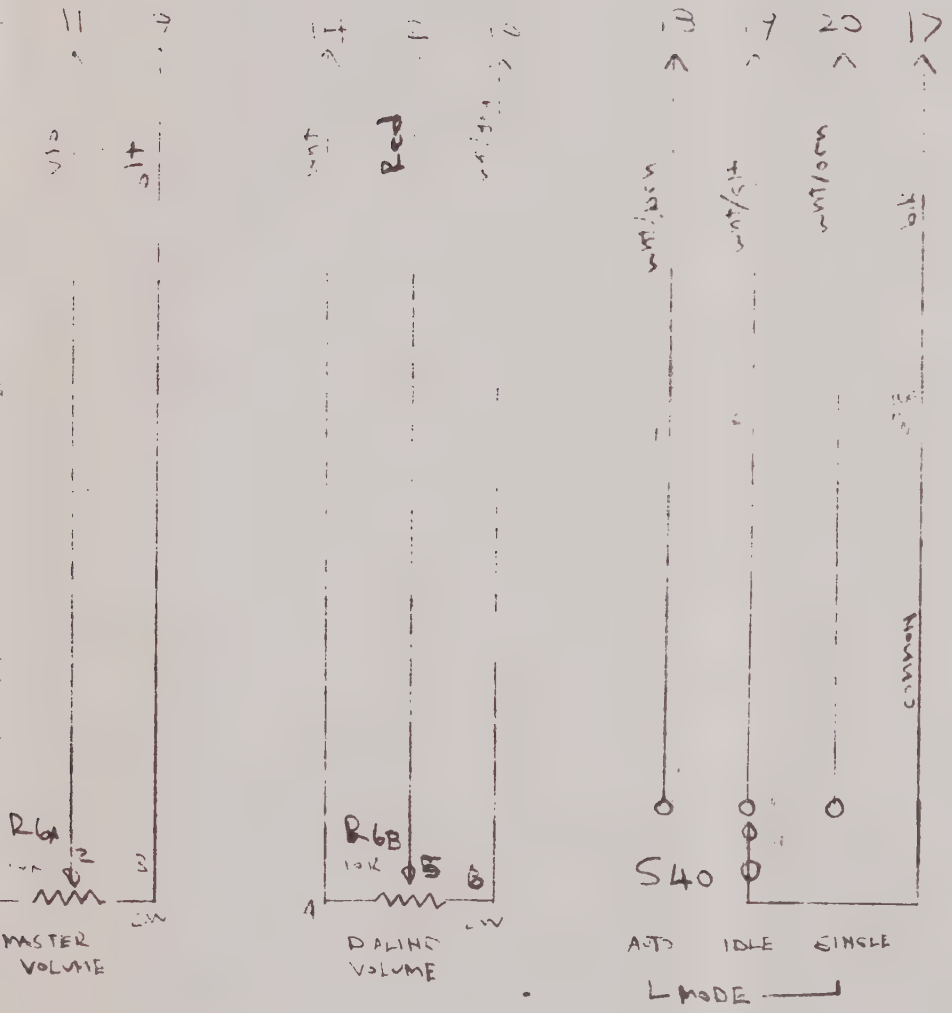
REPAIR

TITLE	NORTHEAST ELECTRONICS int
P3536 CABLE	DRAWN SKN DATE 10-4-99 CHECKED SKN DATE 11-22-99 APPROVED SKN DATE 11-22-99
	SIZE B NUMBER 0041-13-365 ISSUE 1


R3
100K
NETWORK DELAY
R4
100K
TOK
R5
100K
RECYCLE


1 3 5 7 9 11 13 15 17 19
2 4 6 8 10 12 14 16 18 20

0	ORIGINAL ISSUE	9-22-77	SKN



OCT 22 1979

REPAIR

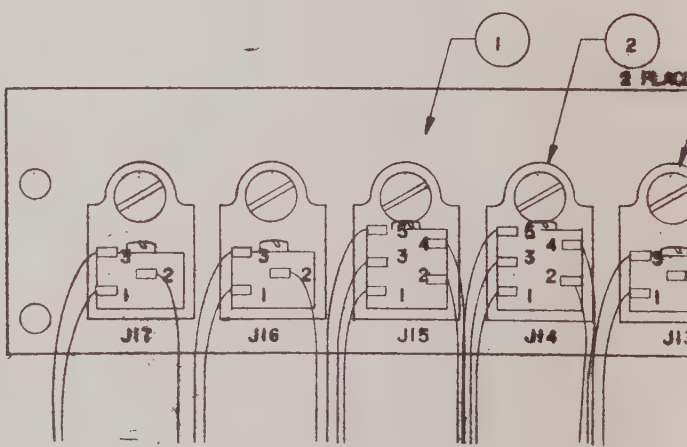
STYLE TIMING MODULE

REV
O

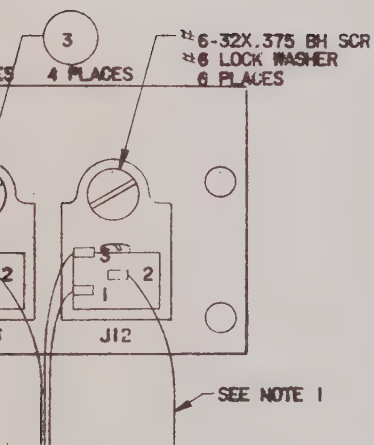
B-3041-3,26

7-22-77 SKN

J12-J17 WIRE LIST					
COLOR	FROM	TITLE	COLOR	FROM	TITLE
GRN	J17-1	EXT TIP	YEL	J17-3	EXT SLEEVE
	J16-1	BRIDGE TIP		J16-3	BRIDGE SLEEVE
	J15-1	CHB TIP		J15-5	CHB SLEEVE
	J14-1	CHA TIP		J14-5	CHA SLEEVE
	J13-1	TIP		J13-3	SLEEVE
GRN	J12-1	TIP	YEL	J12-3	SLEEVE
RED	J17-2	EXT RING	BLU	J15-3	CHB CONTACT
	J16-2	BRIDGE RING	BLU	J14-3	CHA CONTACT
	J15-2	CHB RING	PUR	J15-4	CHB CONTACT
RED	J14-2	CHA RING	PUR	J14-4	CHA CONTACT



REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-	



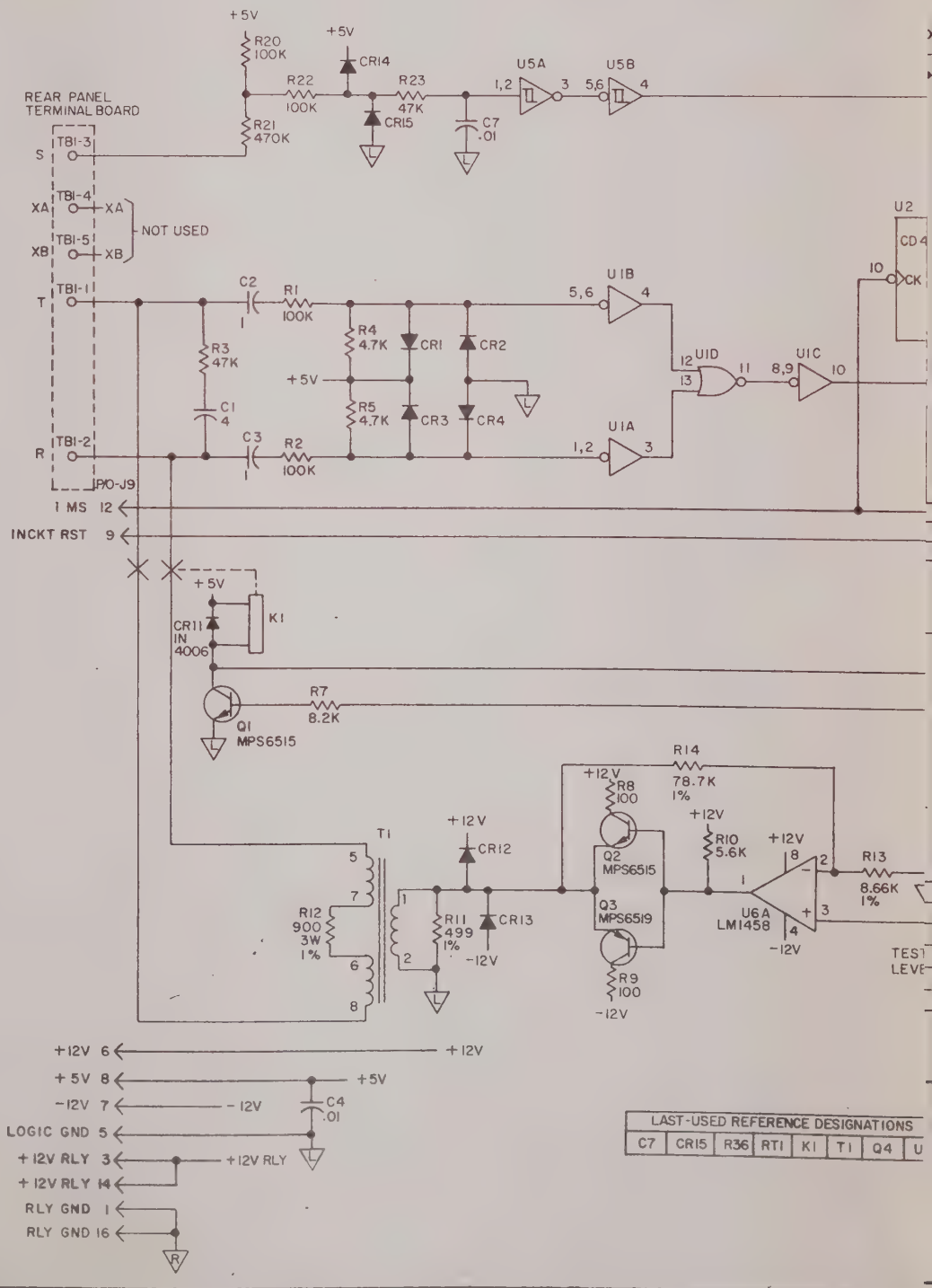
REPAIR

OCT 22 1979

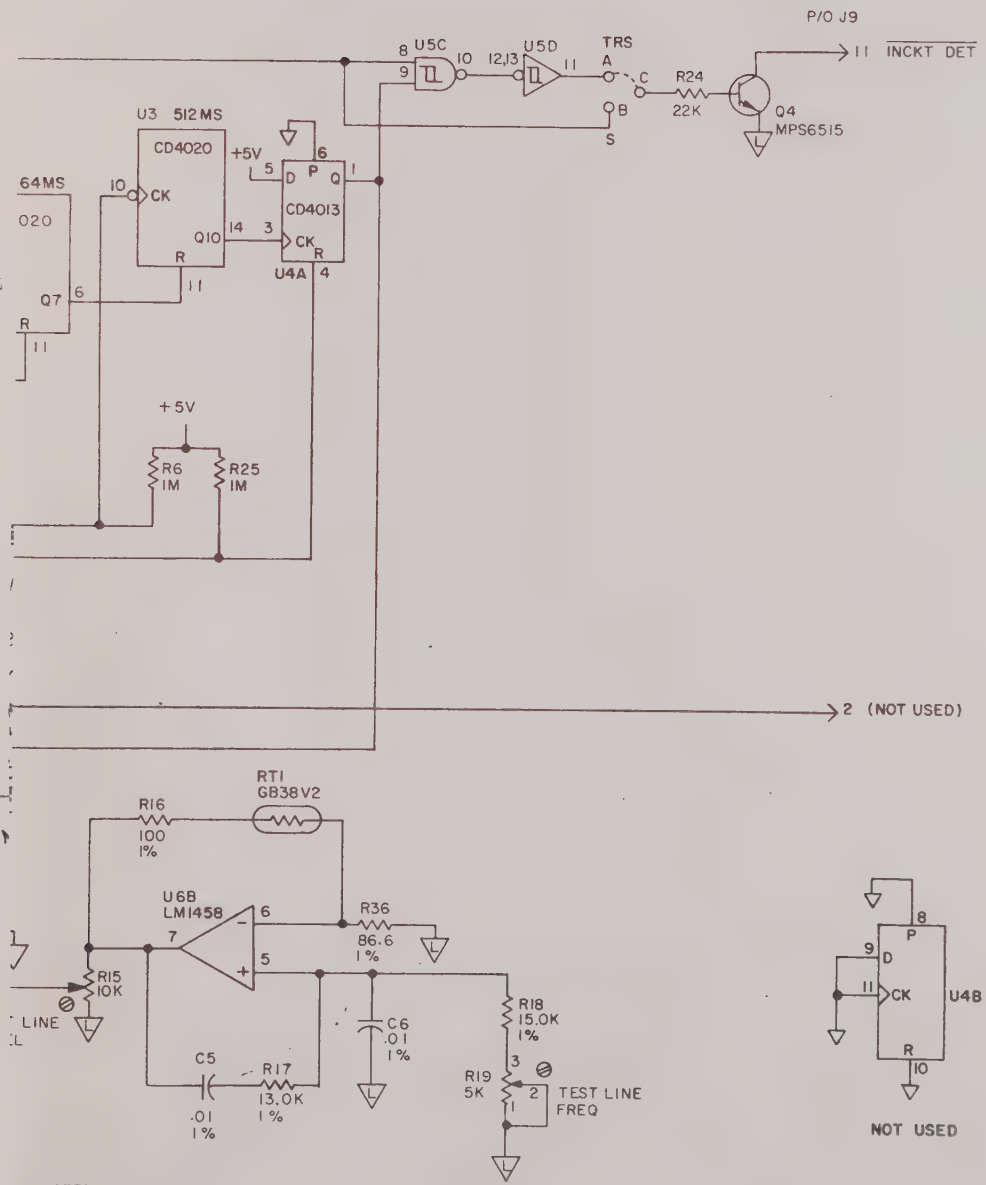
NOTES

1. ALL WIRES TO BE 3" LONG 22 GA. STRANDED.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE: JACK BLOCK ASSY, LINE		NORTHEAST ELECTRONICS inc
ALL TOLERANCES ARE ± .015			
ALL BENDS ARE 90° ± ½°			
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD	FINISH — ETCH AND IRIDITE	MATERIAL	DRAWN [illegible] DATE 8-9-77 SCALE
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT	PAINT — FEDERAL SPEC. 595 COLOR 26492	ALUMINUM 5052 H34 3003 H14	CHECKED DATE 8-9-77
	R AND S VINYL BOND, WHITE		APPROVED DATE 8-9-77
	SCREEN PER		SIZE C NUMBER 0041-13-060 ISSUE 0


+5V
R20 100K
R22 100K
R21 470K
CR14
CR15
R23 47K
C7 .01
U5A
U5B
REAR PANEL TERMINAL BOARD
TBI-3
S
TBI-4
XA
TBI-5
XB
NOT USED
TBI-1
T
TBI-2
R
P0-J9
C2
R1 100K
R3 47K
C1 4
C3
R2 100K
R4 4.7K
R5 4.7K
CR1
CR2
CR3
CR4
U1B
U1A
U1D
U1C
U2
CD4
CK
1 MS 12
INCKT RST 9
CR11 IN 4006
K1
Q1 MPS6515
R7 8.2K
T1
CR12
CR13
R11 499 1%
R12 900 3W 1%
R14 78.7K 1%
R8 100
R10 5.6K
R9 100
Q2 MPS6515
Q3 MPS6519
U6A LM1458
R13 8.66K 1%
-12V
TEST LEVE
+12V 6
+5V 8
-12V 7
LOGIC GND 5
+12V RLY 3
+12V RLY 14
RLY GND 1
RLY GND 16
C4 .01
LAST-USED REFERENCE DESIGNATIONS
C7 CR15 R36 RT1 K1 T1 Q4 U

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
	RECEIVED 4 AC (932) JTM	3-2-79	



NOTES:

1. IC DATA

REF DES	TYPE	VCC (+5V)	GND
U1	CD4001	14	7
U2, U3	CD4020	16	8
U4	CD4013	14	7
U5	CD4093	14	7

2. CAPACITANCE IN MICROFARADS
3. ALL DIODES ARE IN4148

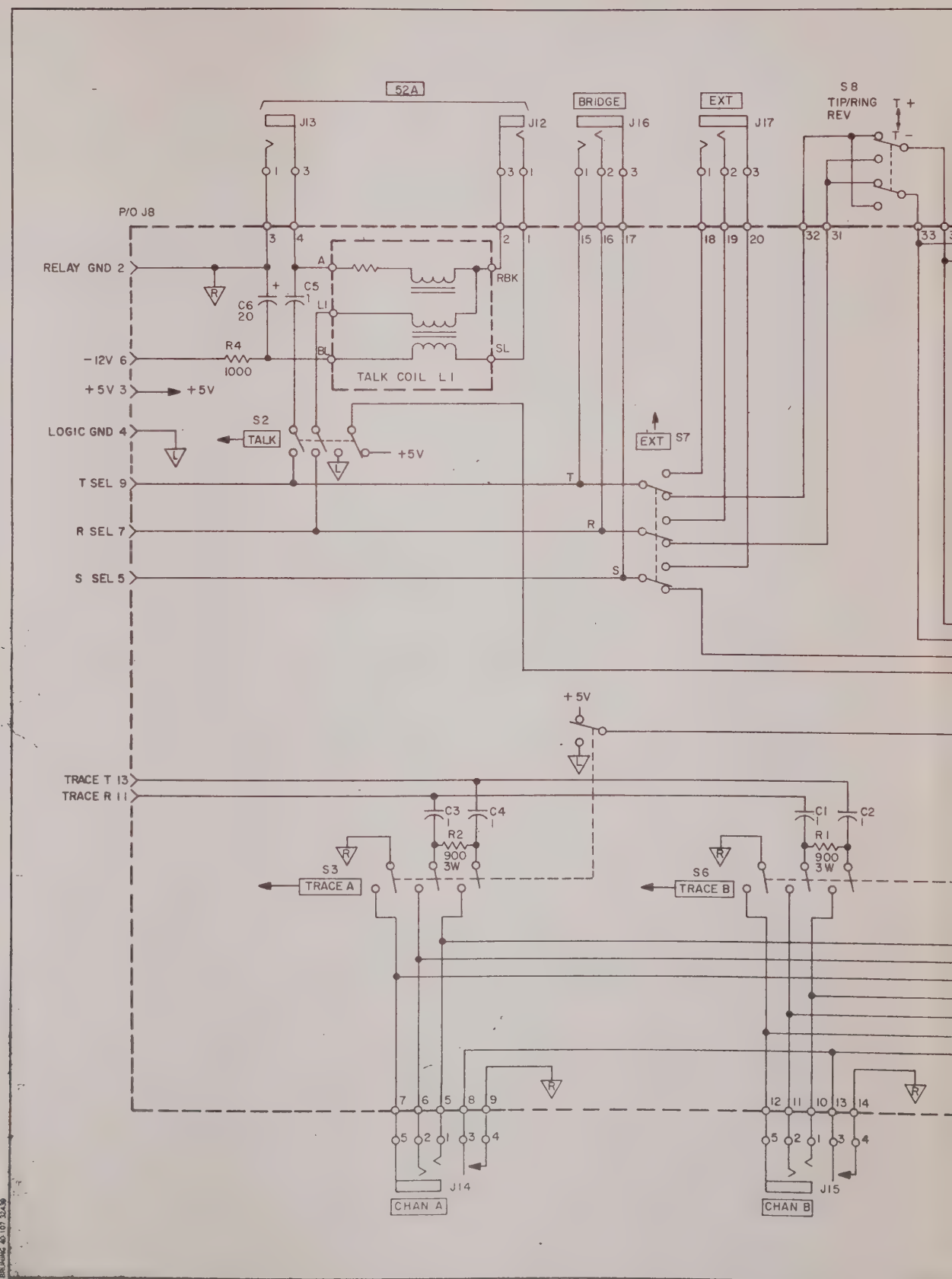
REPAIR

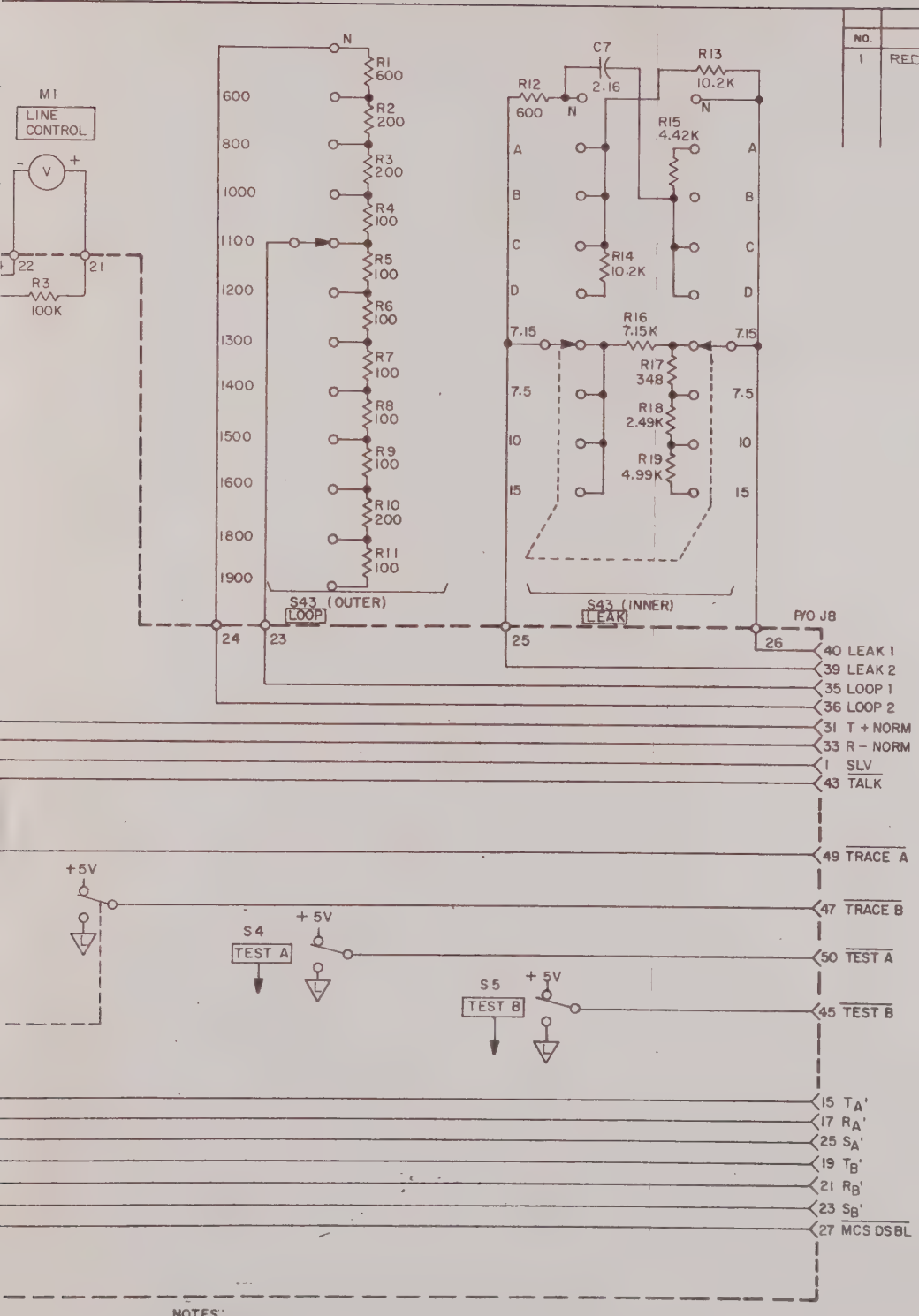
OCT 22 1979

INCOMING CIRCUIT
96826

NORTHEAST ELECTRONICS INC
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN ANTAL	DATE 6/29/78	SCALE	
CHECKED		DATE	
APPROVED		DATE	
SIZE D	NUMBER D 0041-13-3		


52A
J13
J12
BRIDGE
J16
EXT
J17
S8
TIP/RING
REV
T +
T −
P/O J8
RELAY GND 2
−12V 6
+5V 3
+5V
LOGIC GND 4
T SEL 9
R SEL 7
S SEL 5
C6
20
C5
1
R4
1000
A
RBK
L1
BL
SL
TALK COIL L1
S2
TALK
+5V
EXT
S7
T
R
S
TRACE T 13
TRACE R 11
C3
C4
R2
900
3W
S3
TRACE A
C1
C2
R1
900
3W
S6
TRACE B
J14
CHAN A
J15
CHAN B



REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
1	REDRAWN c/o 42 (932)	3-2-7	

NOTES:
1. CAPACITANCE IN MICROFARADS
2. SYMBOLS
   - R RELAY GROUND
   - L LOGIC GROUND
   - QUICK DISCONNECT
3. W8 CONNECTS J8 TO J8 ON MOTHER BOARD

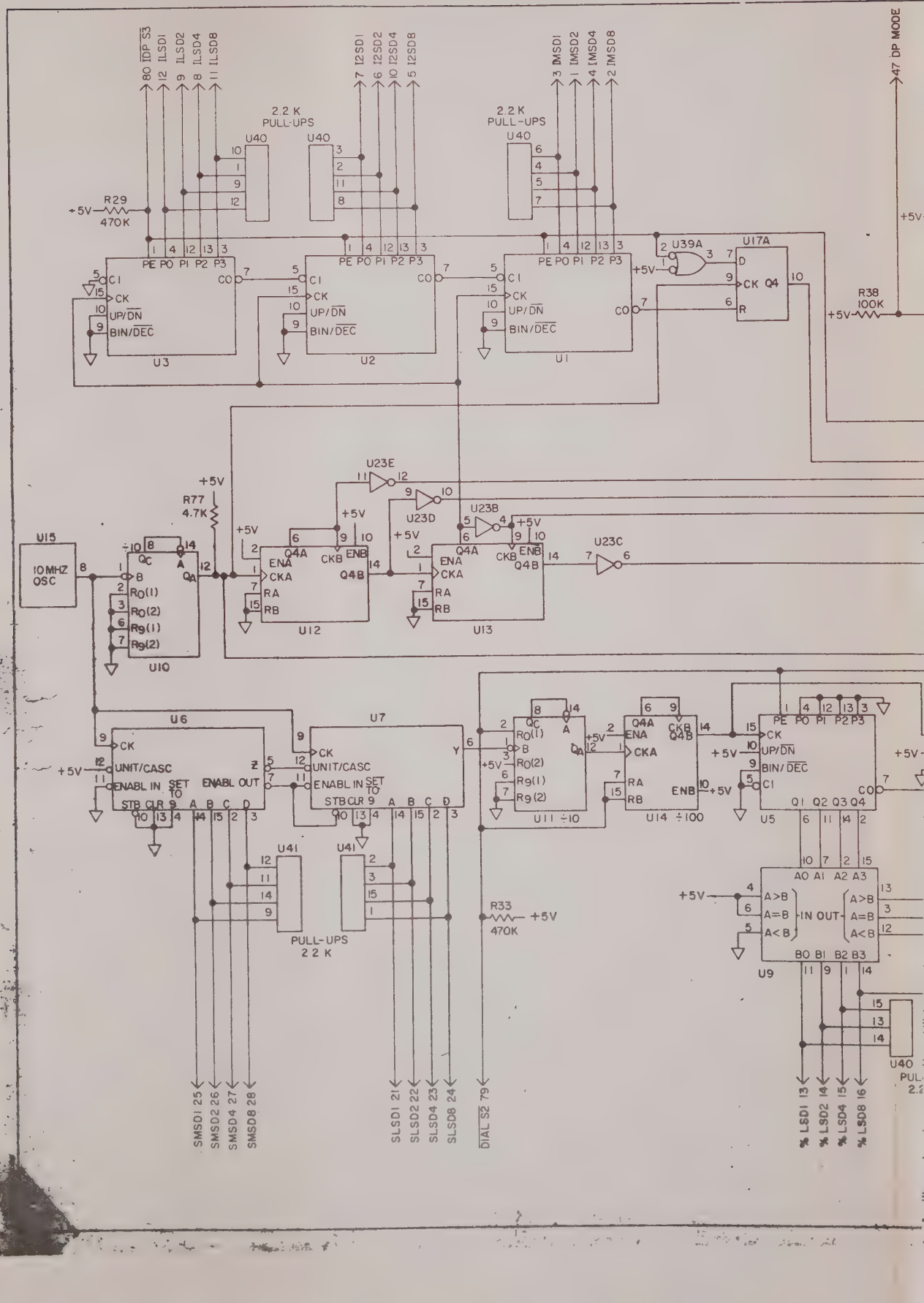
OCT 22 1979

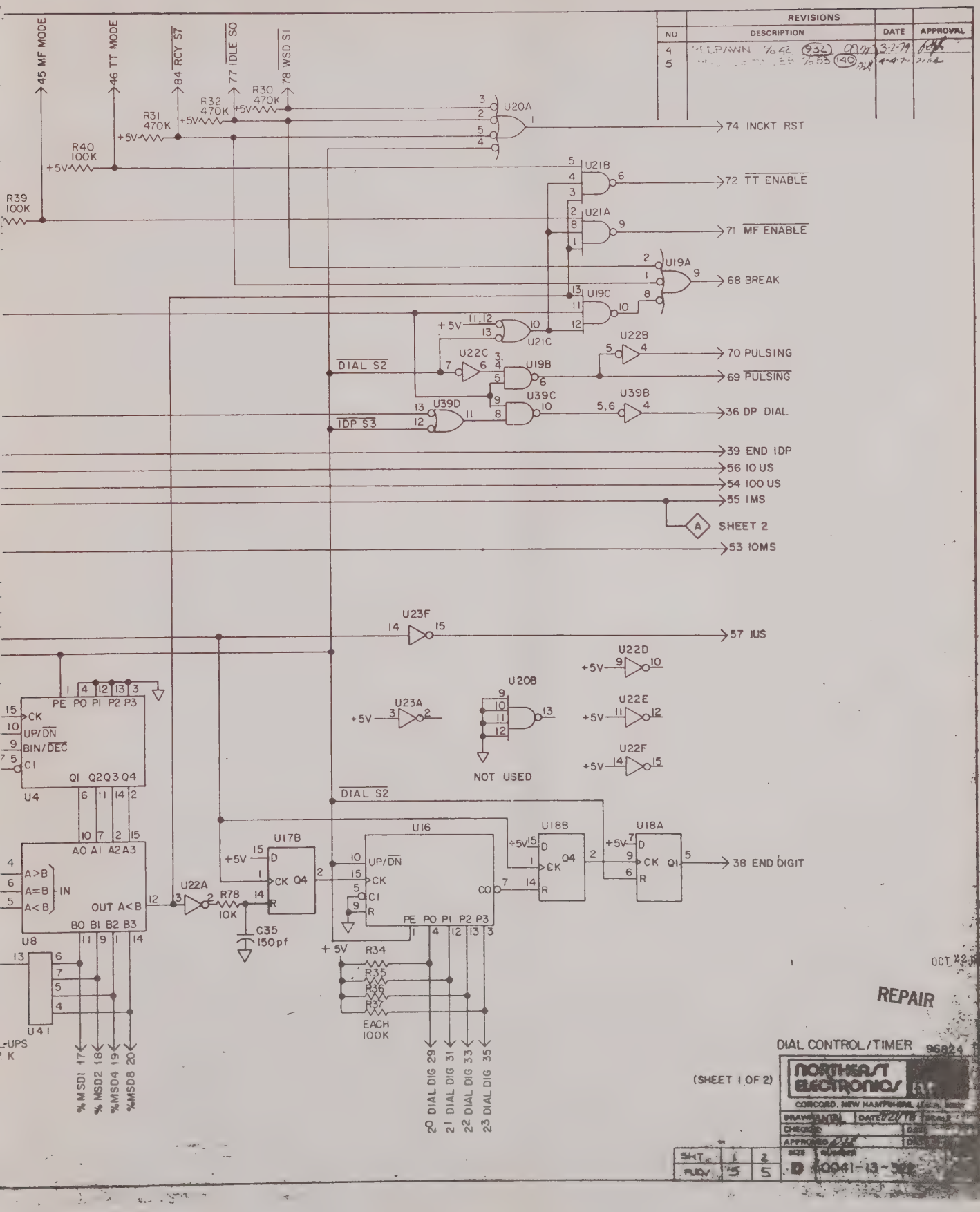
REPAIR

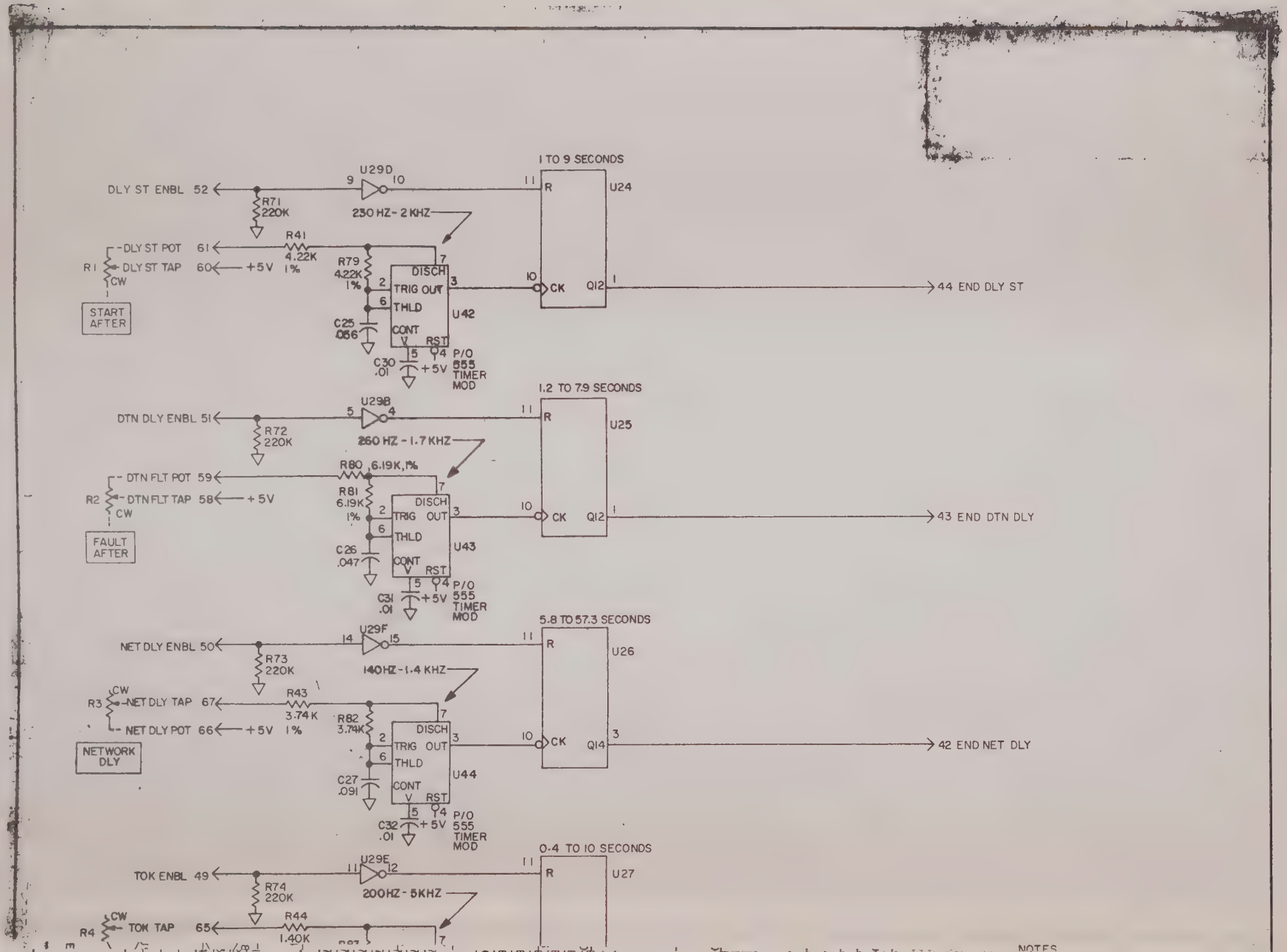
LINE CONTROL BOARD AND LOOP/LEAK NETWORKS

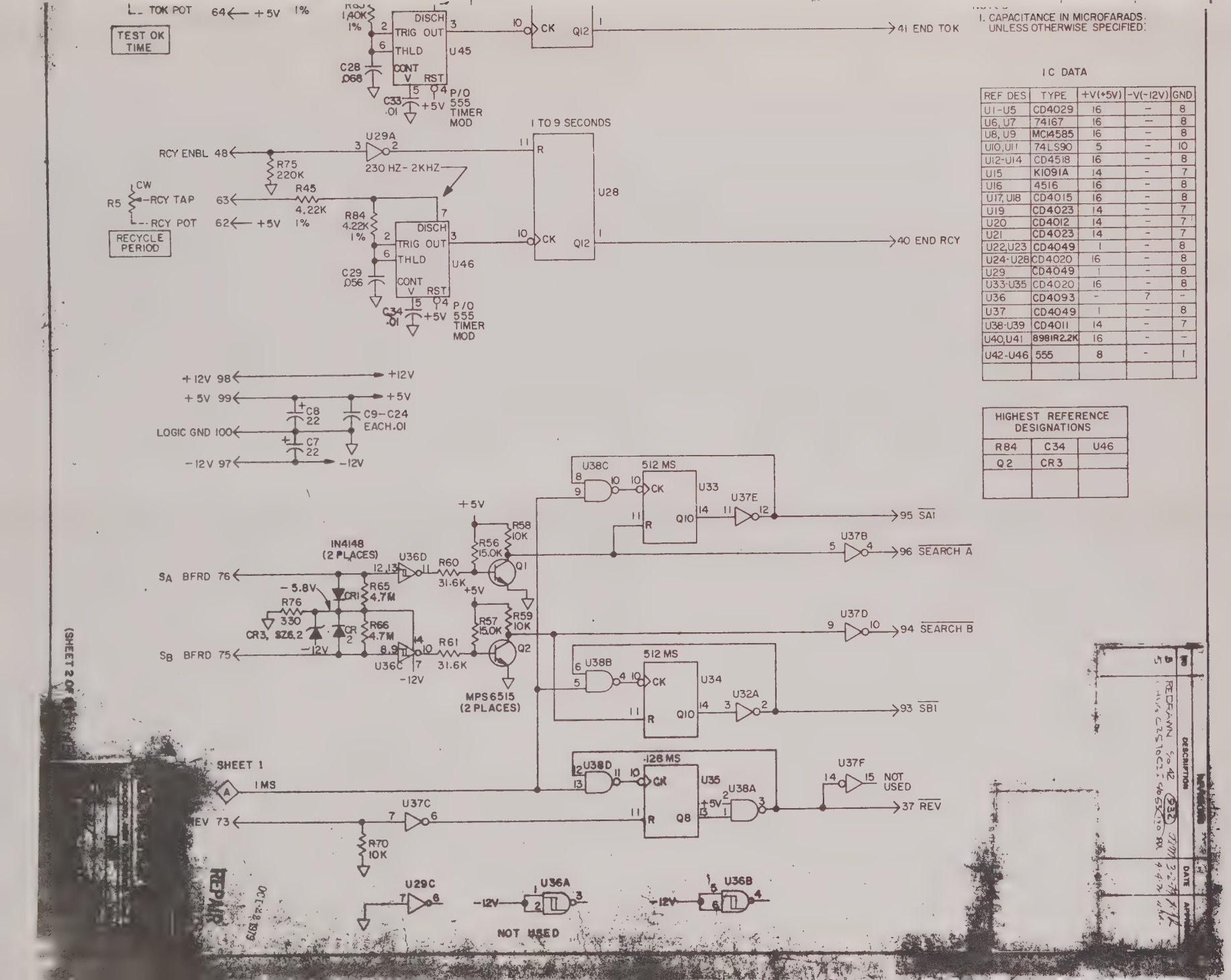
NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE, U.S.A.

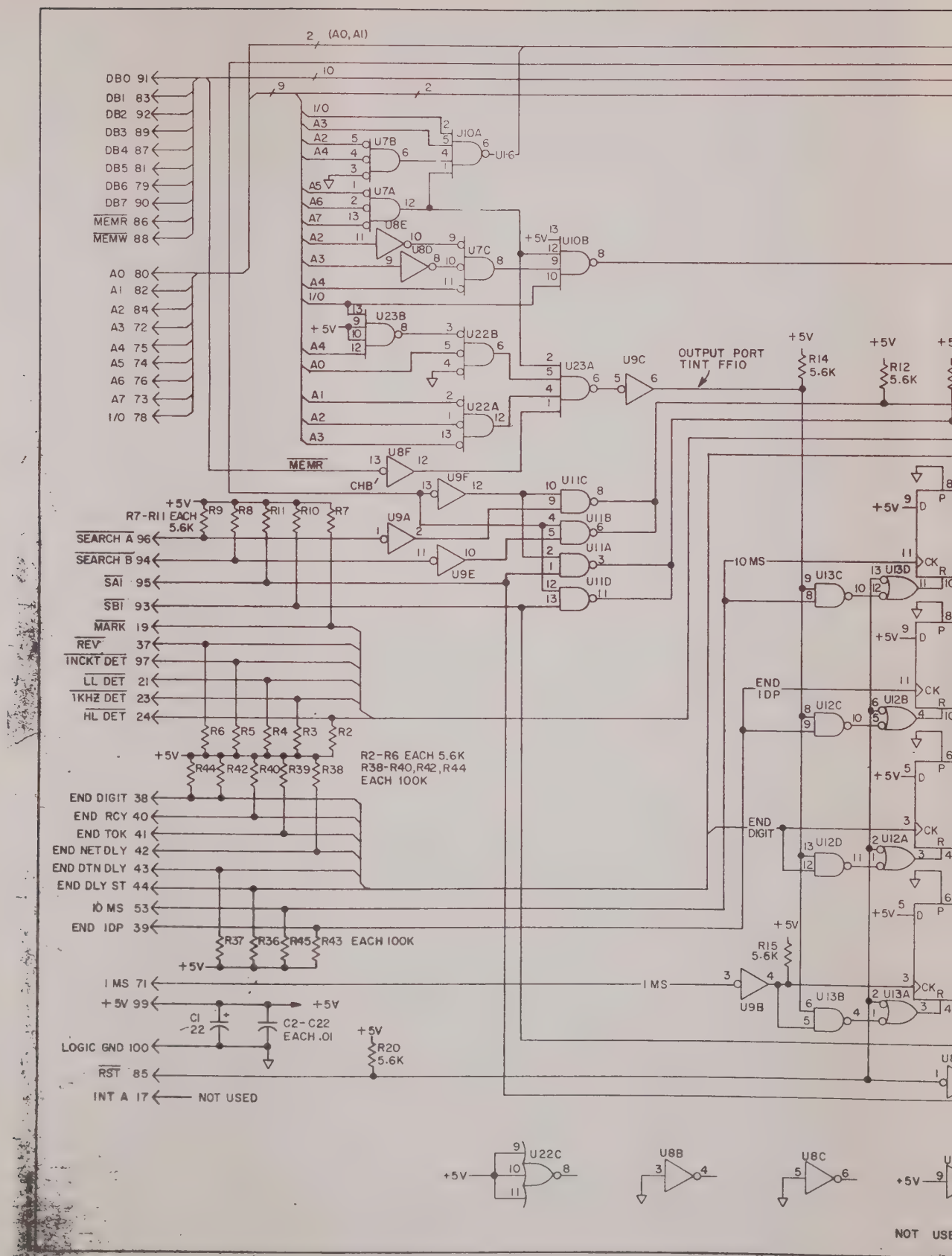
DRAWN	ANTAL	DATE 6/28/78	SCALE
CHECKED		DATE	
APPROVED		DATE	
SIZE D	NUMBER D0041-13-114		

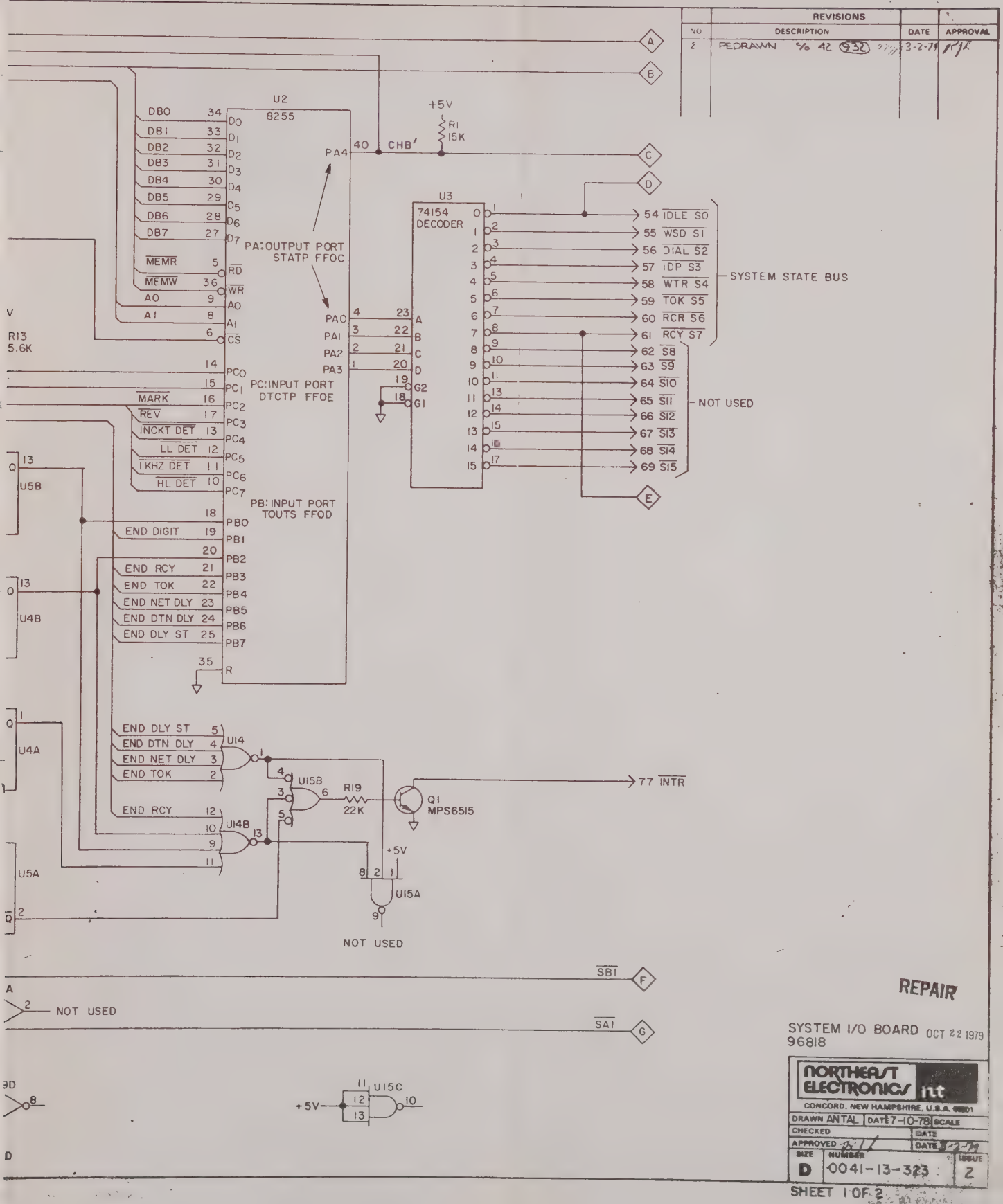

80 IDP S3
12 ILSD1
9 ILSD2
8 ILSD4
11 ILSD8
7 I2SD1
6 I2SD2
10 I2SD4
5 I2SD8
3 IMSD1
1 IMSD2
4 IMSD4
2 IMSD8
47 DP MODE
2.2 K PULL-UPS
U40
R29 470K
+5V
PE PO P1 P2 P3
C1
CK
UP/DN
BIN/DEC
CO
U3
U2
U1
U39A
U17A
CK Q4
R
R38 100K
U23E
U23D
U23B
U23C
R77 4.7K
U15
10 MHZ OSC
÷10
QC
QA
R0(1)
R0(2)
R9(1)
R9(2)
U10
Q4A
CKB
ENB
Q4B
ENA
CKA
RA
RB
U12
U13
U6
U7
CK
UNIT/CASC
ENABL IN
SET TO
ENABL OUT
STB CLR
A B C D
U41
PULL-UPS 2.2 K
R33 470K
U11 ÷10
U14 ÷100
U5
Q1 Q2 Q3 Q4
U9
A0 A1 A2 A3
A>B
A=B
A<B
IN
OUT
B0 B1 B2 B3
U40
PUL
2.2
SMSD1 25
SMSD2 26
SMSD4 27
SMSD8 28
SLSD1 21
SLSD2 22
SLSD4 23
SLSD8 24
DIAL S2 79
% LSD1 13
% LSD2 14
% LSD4 15
% LSD8 16


REVISIONS
NO
DESCRIPTION
DATE
APPROVAL
45 MF MODE
46 TT MODE
84 RCY S7
77 IDLE SO
78 WSD S1
R30 470K
R32 470K
R31 470K
R40 100K
R39 100K
+5V
U20A
U21B
U21A
U19A
U19C
U21C
U22B
U22C
U19B
U39D
U39C
U39B
DIAL S2
IDP S3
74 INCKT RST
72 TT ENABLE
71 MF ENABLE
68 BREAK
70 PULSING
69 PULSING
36 DP DIAL
39 END IDP
56 10 US
54 100 US
55 1MS
A
SHEET 2
53 10MS
57 1US
U23F
U22D
U23A
U20B
U22E
U22F
NOT USED
U4
PE P0 P1 P2 P3
CK
UP/DN
BIN/DEC
CI
Q1 Q2 Q3 Q4
U8
A0 A1 A2 A3
A>B
A=B
A<B
IN
OUT A<B
B0 B1 B2 B3
U41
U22A
R78 10K
C35 150pf
U17B
U16
U18B
U18A
38 END DIGIT
R34
R35
R36
R37
EACH 100K
%MSD1 17
%MSD2 18
%MSD4 19
%MSD8 20
20 DIAL DIG 29
21 DIAL DIG 31
22 DIAL DIG 33
23 DIAL DIG 35
OCT 22
REPAIR
DIAL CONTROL/TIMER 96824
(SHEET 1 OF 2)
NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE
SIZE D
SHT 1 2
REV 5 5


1 TO 9 SECONDS
U29D
DLY ST ENBL 52
R71 220K
230 HZ - 2 KHZ
R41
DLY ST POT 61
DLY ST TAP 60
+5V
4.22K 1%
R1
CW
START AFTER
R79 4.22K 1%
DISCH
TRIG OUT
THLD
CONT
RST
U42
C25 .056
C30 .01
+5V
P/O 555 TIMER MOD
U24
R
CK
Q12
44 END DLY ST
1.2 TO 7.9 SECONDS
U29B
DTN DLY ENBL 51
R72 220K
260 HZ - 1.7 KHZ
R80 6.19K, 1%
DTN FLT POT 59
DTN FLT TAP 58
+5V
R2
CW
FAULT AFTER
R81 6.19K 1%
U43
C26 .047
C31 .01
U25
43 END DTN DLY
5.8 TO 57.3 SECONDS
U29F
NET DLY ENBL 50
R73 220K
140 HZ - 1.4 KHZ
R43
CW
NET DLY TAP 67
NET DLY POT 66
3.74K
R3
NETWORK DLY
R82 3.74K
U44
C27 .091
C32 .01
U26
Q14
42 END NET DLY
0.4 TO 10 SECONDS
U29E
TOK ENBL 49
R74 220K
200 HZ - 5 KHZ
R44
CW
TOK TAP 65
1.40K
R4
U27
NOTES


TOK POT 64 +5V 1%
TEST OK TIME
DISCH
TRIG OUT
THLD
CONT
V
RST
U45
C28 .068
C33 .01
+5V
P/O 555 TIMER MOD
CK
Q12
41 END TOK
1 TO 9 SECONDS
U28
RCY ENBL 48
U29A
230 HZ - 2KHZ
R75 220K
R5
CW
RCY TAP 63
RCY POT 62 +5V 1%
R45 4.22K
R84 4.22K 1%
U46
C29 .056
C34 .01
RECYCLE PERIOD
40 END RCY
+12V 98
+5V 99
LOGIC GND 100
-12V 97
C8 22
C7 22
C9-C24 EACH.01
IN4148 (2 PLACES)
SA BFRD 76
SB BFRD 75
U36D
U36C
R60 31.6K
R61 31.6K
R65 4.7M
R66 4.7M
R76 330
CR1
CR2
CR3, SZ6.2
-5.8V
-12V
+5V
R56 15.0K
R58 10K
R57 15.0K
R59 10K
Q1
Q2
MPS6515 (2 PLACES)
U38C
512 MS
U33
U37E
95 SAI
U37B
96 SEARCH A
U37D
94 SEARCH B
U38B
U34
U32A
93 SBI
128 MS
U38D
U35
U38A
U37F
NOT USED
37 REV
SHEET 1
1 MS
REV 73
U37C
R70 10K
U29C
U36A
U36B
NOT USED
I. CAPACITANCE IN MICROFARADS. UNLESS OTHERWISE SPECIFIED.
I C DATA
REF DES | TYPE | +V(+5V) | -V(-12V) | GND
U1-U5 | CD4029 | 16 | - | 8
U6, U7 | 74167 | 16 | - | 8
U8, U9 | MC14585 | 16 | - | 8
U10, U11 | 74LS90 | 5 | - | 10
U12-U14 | CD4518 | 16 | - | 8
U15 | K1091A | 14 | - | 7
U16 | 4516 | 16 | - | 8
U17, U18 | CD4015 | 16 | - | 8
U19 | CD4023 | 14 | - | 7
U20 | CD4012 | 14 | - | 7
U21 | CD4023 | 14 | - | 7
U22, U23 | CD4049 | 1 | - | 8
U24-U28 | CD4020 | 16 | - | 8
U29 | CD4049 | 1 | - | 8
U33-U35 | CD4020 | 16 | - | 8
U36 | CD4093 | - | 7 | -
U37 | CD4049 | 1 | - | 8
U38-U39 | CD4011 | 14 | - | 7
U40, U41 | 898IR2.2K | 16 | - | -
U42-U46 | 555 | 8 | - | 1
HIGHEST REFERENCE DESIGNATIONS
R84 | C34 | U46
Q2 | CR3
REDRAWN
DESCRIPTION
DATE
APPD


DB0 91
DB1 83
DB2 92
DB3 89
DB4 87
DB5 81
DB6 79
DB7 90
MEMR 86
MEMW 88
A0 80
A1 82
A2 84
A3 72
A4 75
A5 74
A6 76
A7 73
I/O 78
U7B
U7A
U8E
U8D
U7C
U10A
U10B
U23B
U22B
U23A
U22A
U9C
OUTPUT PORT
TINT FF10
R14
5.6K
R12
5.6K
MEMR
U8F
CHB
U9F
U9A
U9E
U11C
U11B
U11A
U11D
R7-R11 EACH
5.6K
R9
R8
R11
R10
R7
SEARCH A 96
SEARCH B 94
SAI 95
SBI 93
MARK 19
REV 37
INCKT DET 97
LL DET 21
1KHZ DET 23
HL DET 24
R6
R5
R4
R3
R2
R44
R42
R40
R39
R38
R2-R6 EACH 5.6K
R38-R40,R42,R44
EACH 100K
END DIGIT 38
END RCY 40
END TOK 41
END NET DLY 42
END DTN DLY 43
END DLY ST 44
10 MS 53
END IDP 39
R37
R36
R45
R43 EACH 100K
1 MS 71
+5V 99
C1
-22
C2-C22
EACH .01
LOGIC GND 100
RST 85
R20
5.6K
INT A 17
NOT USED
10 MS
END
IDP
END
DIGIT
U13C
U13D
U12C
U12B
U12D
U12A
R15
5.6K
U9B
1 MS
U13B
U13A
U22C
U8B
U8C
NOT USE



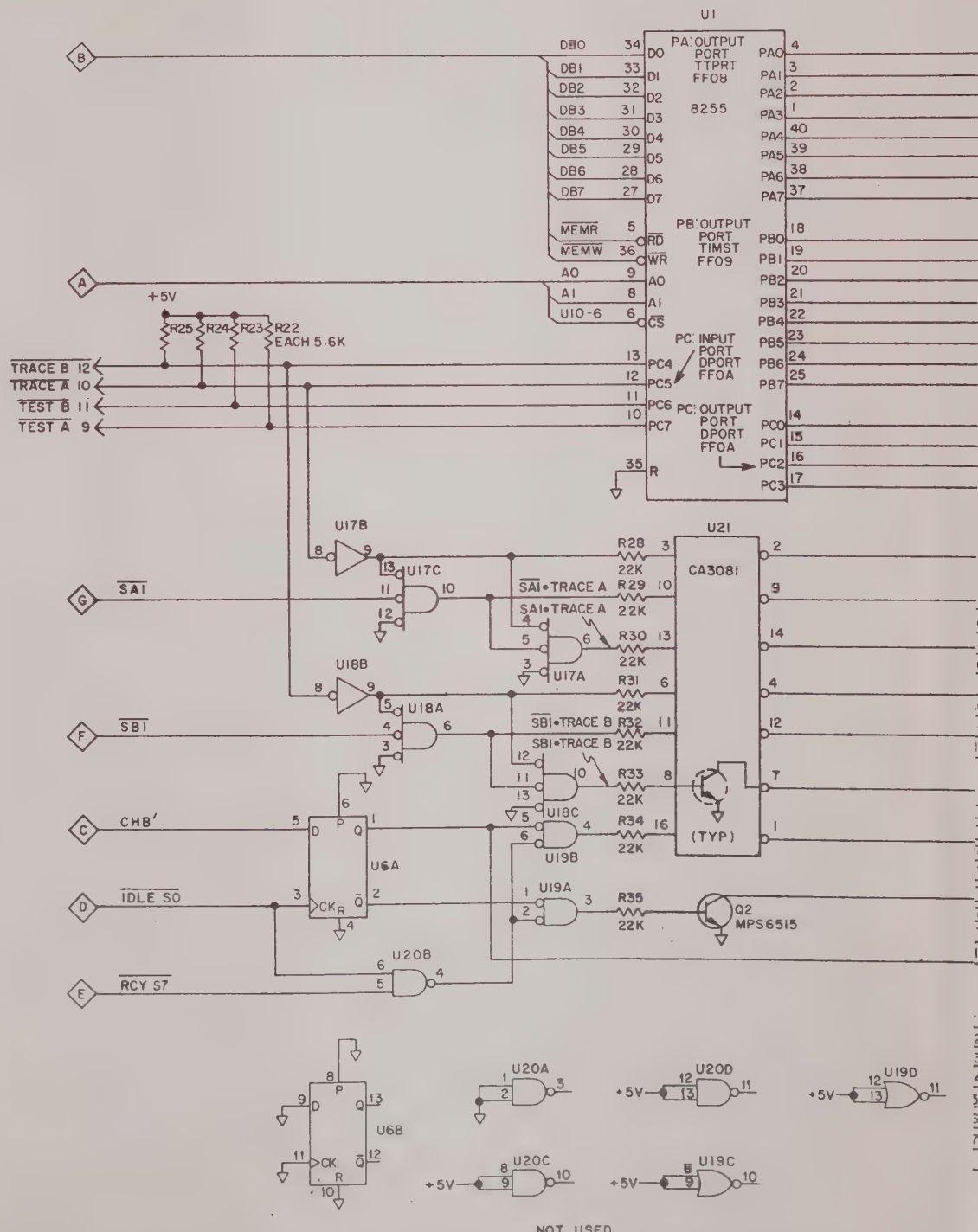
REPAIR

SYSTEM I/O BOARD OCT 22 1979
96818

NORTHEAST ELECTRONICS int
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN ANTAL	DATE 7-10-78	SCALE	
CHECKED		DATE	
APPROVED		DATE 2-2-79	
SIZE D	NUMBER 0041-13-323		ISSUE 2

SHEET 1 OF 2


U1
8255
PA: OUTPUT PORT TTPRT FF08
PB: OUTPUT PORT TIMST FF09
PC: INPUT PORT DPORT FF0A
PC: OUTPUT PORT DPORT FF0A
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
MEMR
MEMW
A0
A1
U10-6
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PC0
PC1
PC2
PC3
PC4
PC5
PC6
PC7
+5V
R25 R24 R23 R22
EACH 5.6K
TRACE B
TRACE A
TEST B
TEST A
U17B
U17C
U18B
U18A
U17A
U18C
U19B
U19A
U20B
U6A
U6B
U20A
U20D
U19D
U20C
U19C
U21
CA3081
R28 22K
R29 22K
R30 22K
R31 22K
R32 22K
R33 22K
R34 22K
R35 22K
SAI•TRACE A
SBI•TRACE B
(TYP)
Q2
MPS6515
SAI
SBI
CHB'
IDLE SO
RCY S7
NOT USED

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
2	REDRAWN % 42 (932)	3-2-79	

→25 TTMF0
→26 TTMF1
→27 TTMF2
→28 TTMF3
→29 TTMF4
→31 TTMF5
→33 TTMF6
→35 TTMF7

→45 MF MODE
→46 TT MODE
→47 DP MODE
→48 RCY ENBL
→49 TOK ENBL
→50 NET DLY ENBL
→51 DTN FLT ENBL
→52 DLY ST ENBLE

→30 2^0 DIAL DIGIT
→32 2^1 DIAL DIGIT
→34 2^2 DIAL DIGIT
→36 2^3 DIAL DIGIT

→5 $\overline{\text{TRAL}}$

→6 $\overline{\text{IDLAL}}$

→8 $\overline{\text{BSYAL}}$

→3 $\overline{\text{TRBL}}$

→4 $\overline{\text{IDLBL}}$

→1 $\overline{\text{BSYBL}}$

→7 $\overline{\text{UTAL}}$

→2 $\overline{\text{UTBL}}$

→98 CH B

LAST-USED REFERENCE DESIGNATIONS				
C22	Q2	R45	U23	

NOTES:
1. CAPACITANCE IN MICROFARADS
2. IC DATA

REF DES	TYPE	+V(+5V)	GND
U1,U2	8255	26	7
U3	74154	24	12
U4-U6	CD4013	14	7
U7	74LS27	14	7
U8,U9	74LS04	14	7
U10	74LS20	14	7
U11	74LS03	14	7
U12,U13	CD4011	14	7
U14	CD4002	14	7
U15	CD4023	14	7
U17,U18	CD4000	14	7
U19	CD4001	14	7
U20	CD4011	14	7
U21	CA3081		5,15
U22	74LS27	14	7
U23	74LS20	14	7

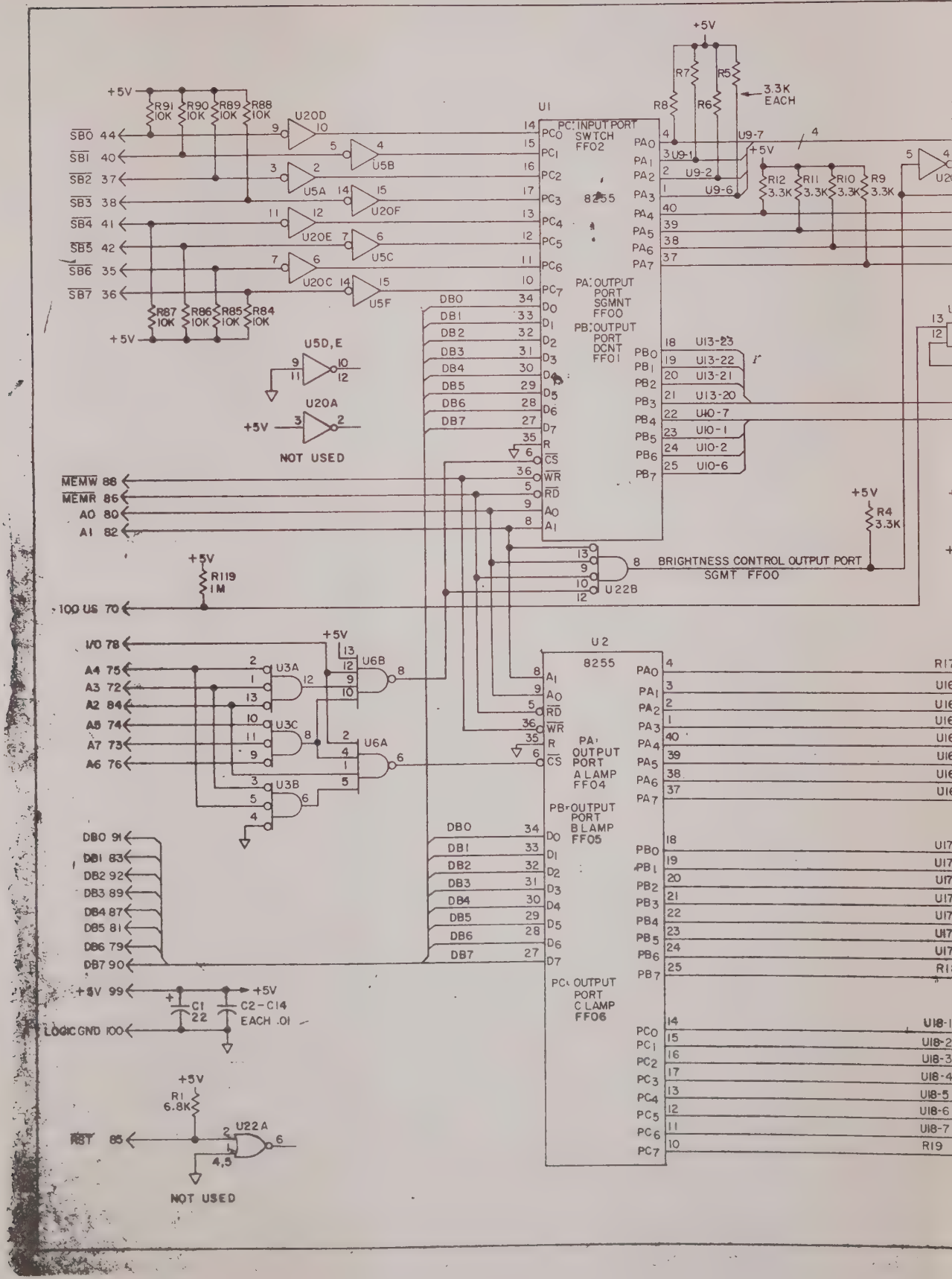
REPAIR

OCT 22 1979

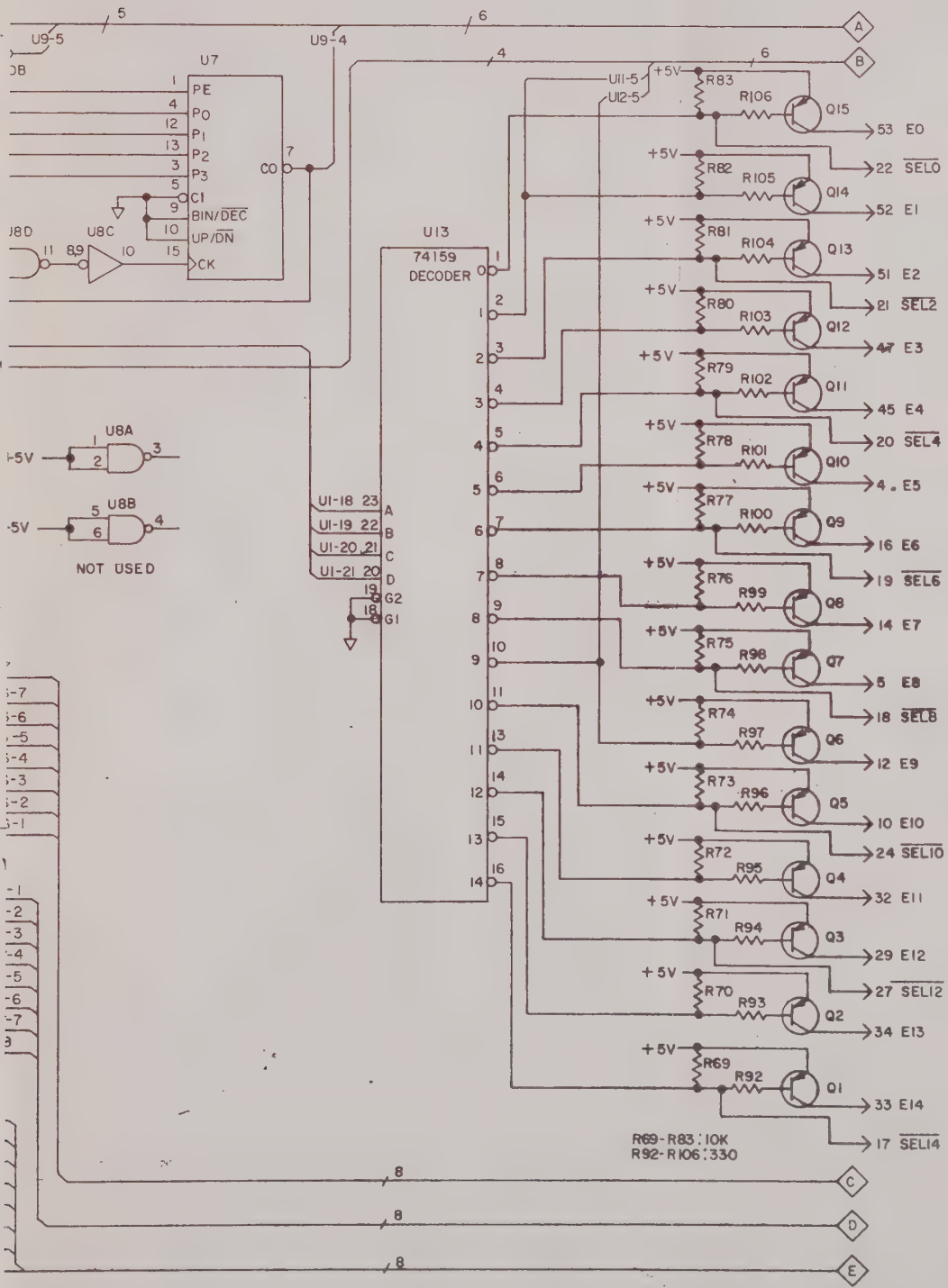
(SHEET 2 OF 2)

SYSTEM I/O BOARD 96818

NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE, U.S.A.
DRAWN ANTAL DATE
CHECKED DATE
APPROVED
SIZE D NUMBER D0041-15-323


+5V
R91 10K
R90 10K
R89 10K
R88 10K
U20D
SB0 44
SB1 40
SB2 37
SB3 38
SB4 41
SB5 42
SB6 35
SB7 36
U5B
U5A
U20F
U20E
U5C
U20C
U5F
R87 10K
R86 10K
R85 10K
R84 10K
U5D,E
U20A
NOT USED
U1
PC: INPUT PORT SWTCH FF02
8255
PA: OUTPUT PORT SGMNT FF00
PB: OUTPUT PORT DGNT FF01
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
MEMW 88
MEMR 86
A0 80
A1 82
U13-23
U13-22
U13-21
U13-20
U10-7
U10-1
U10-2
U10-6
R7
R5
R8
R6
3.3K EACH
U9-7
U9-1
U9-2
U9-6
R12 3.3K
R11 3.3K
R10 3.3K
R9 3.3K
R4 3.3K
BRIGHTNESS CONTROL OUTPUT PORT SGMT FF00
U22B
R119 1M
100 US 70
I/O 78
A4 75
A3 72
A2 84
A5 74
A7 73
A6 76
U3A
U3C
U3B
U6B
U6A
U2
PA: OUTPUT PORT A LAMP FF04
PB: OUTPUT PORT B LAMP FF05
PC: OUTPUT PORT C LAMP FF06
DB0 91
DB1 83
DB2 92
DB3 89
DB4 87
DB5 81
DB6 79
DB7 90
+5V 99
LOGIC GND 100
C1 22
C2-C14 EACH .01
R1 6.8K
RST 85
U22A
NOT USED

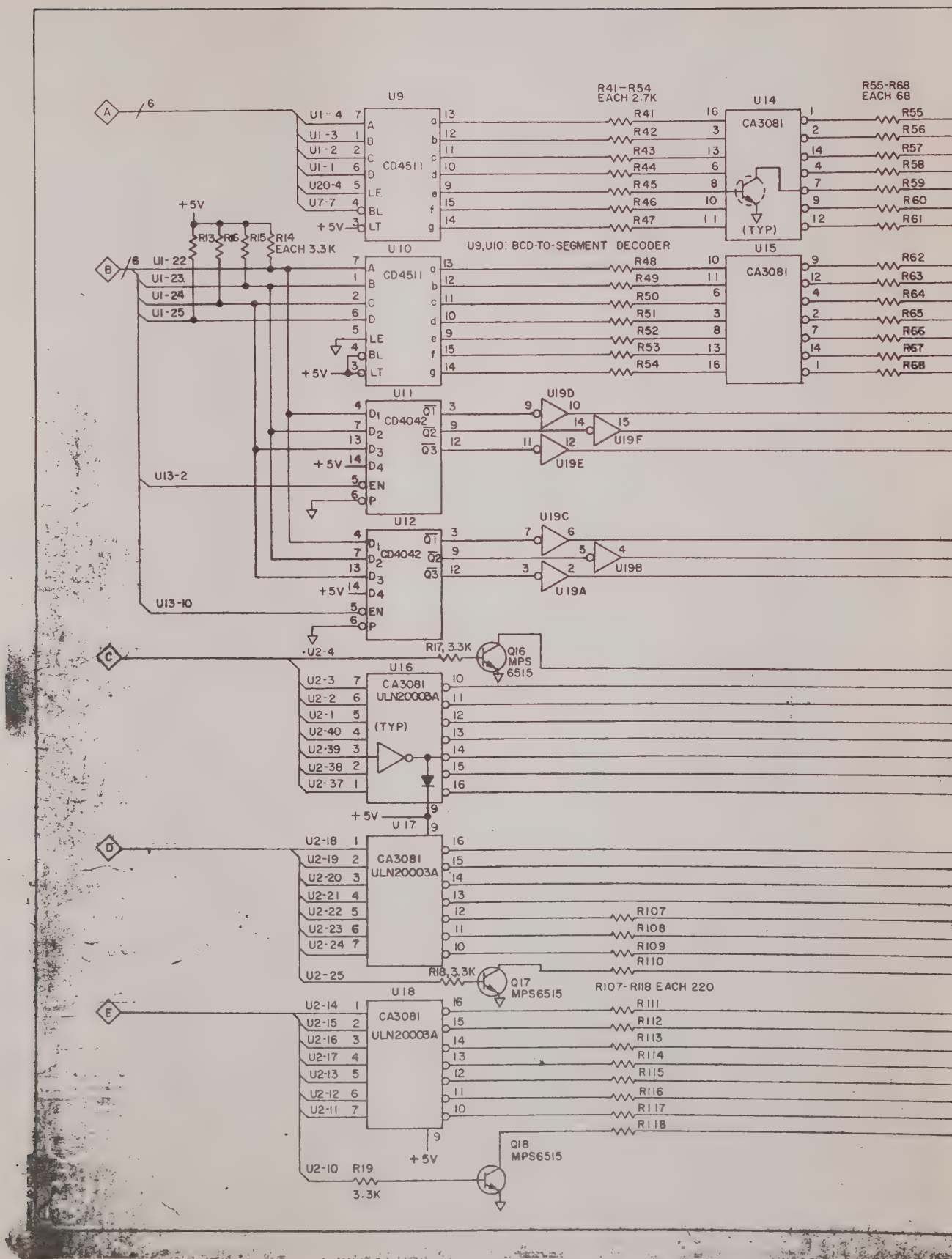
REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
3	REDRAWN c/o 42 (932)	3-2-79	



REPAIR
OCT 22 1979

DISPLAY I/O BOARD 96819

NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE, U.S.A.
DRAWN ANTAL DATE 7/5/78 SCALE
CHECKED DATE
APPROVED DATE
SIZE D SHEET 1 OF 2


U9
U10
U11
U12
U14
U15
U16
U17
U18
CD4511
CD4042
CA3081
ULN20003A
(TYP)
U9,U10: BCD-TO-SEGMENT DECODER
R41-R54 EACH 2.7K
R55-R68 EACH 68
R13, R16, R15, R14 EACH 3.3K
+5V
U13-2
U13-10
U19A
U19B
U19C
U19D
U19E
U19F
R17, 3.3K
Q16 MPS 6515
R18, 3.3K
Q17 MPS6515
R107-R118 EACH 220
Q18 MPS6515
R19 3.3K

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
5	REDRAWN C/O 42 (932)	3-2-79	

→61 ā
→62 b̄
→64 c̄
→63 d̄
→59 ē
→60 f̄
→65 ḡ

→50 LINE a
→49 LINE b
→2 LINE c
→3 LINE d
→1 LINE e
→48 LINE f
→46 LINE g

→98 A•A
→97 A•B
→96 A•C

→95 B•A
→94 B•B
→93 B•C

→11 TOKL
→8 WTRL
→6 DIALING L
→54 IDPL
→55 WSDL
→57 TTYL
→58 ONHKL
→56 IDLE L

LAST-USED REFERENCE DESIGNATIONS				
C14	Q15	R119	U22	

NOTES:
1. CAPACITANCE IN MICROFARADS
2. ALL TRANSISTORS MJE371 UNLESS OTHERWISE SPECIFIED
3. I C DATA

REF DES	TYPE	VDD(+5V)	GND
U1, U2	8255	26	7
U3	74LS27	14	7
U5	CD4049	1	8
U6	74LS20	14	7
U7	CD4029	16	8
U8	CD4011	14	7
U9, U10	CD4511	16	8
U11, U12	CD4042	16	8
U13	SN74159	24	12
U14, U15	CA3081	-	5, 15
U19, U20	CD4049	1	8
U22	SN7425	14, 11, 3	7
U16-U18	ULN20003A	-	8

→7 SYST HLDL
→9 ORL
→13 PWR INT L
→15 PROG ERR L
→30 NO DTL
→28 OPEN CL
→26 REVDDL
→23 REOL

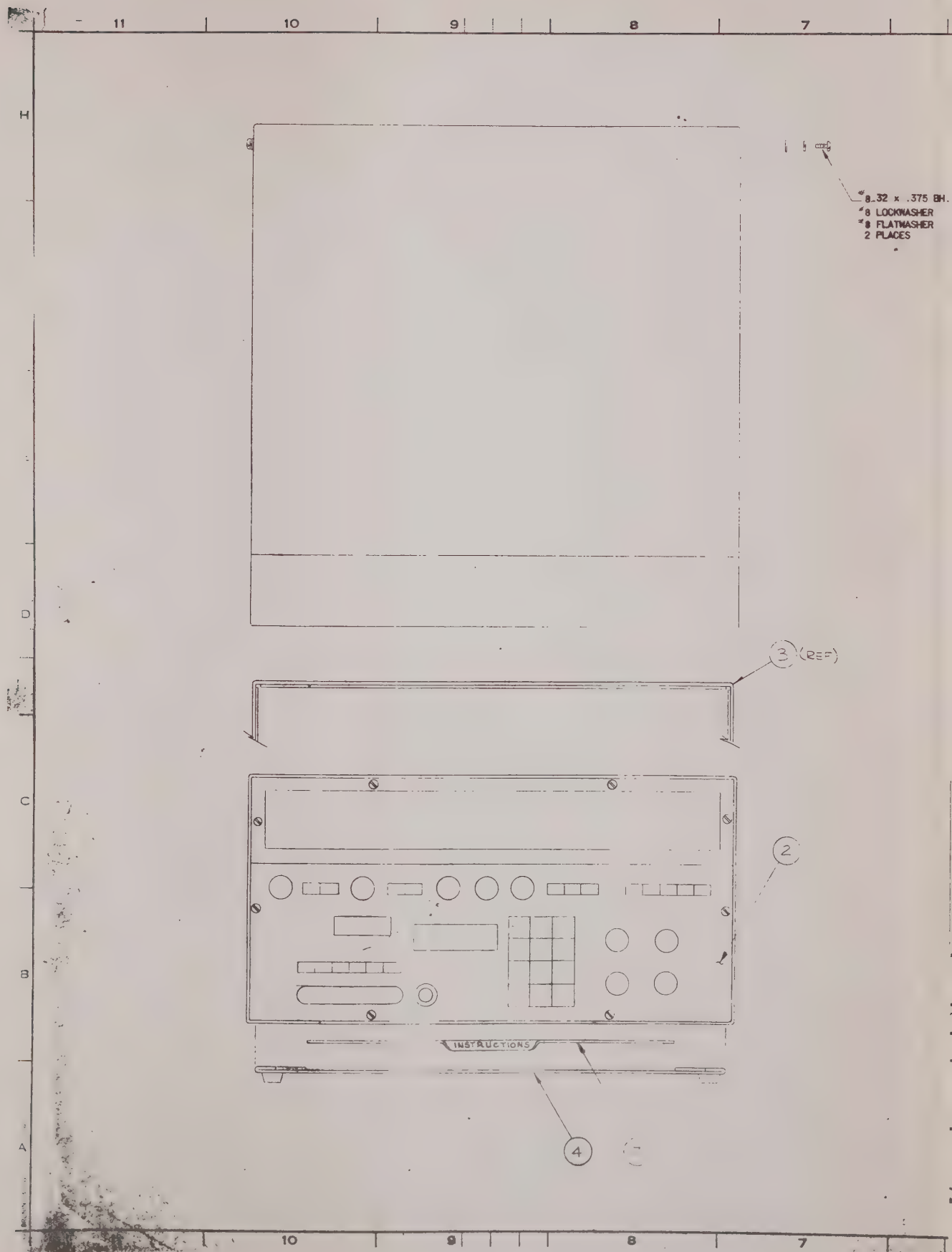
→25 REO + ANSL
→31 BSY + ANSL
→39 BUSYL
→43 LOL
→66 NO 1KHZL
→68 HTL
→67 NO ANSL
→69 INCKTL

REPAIR

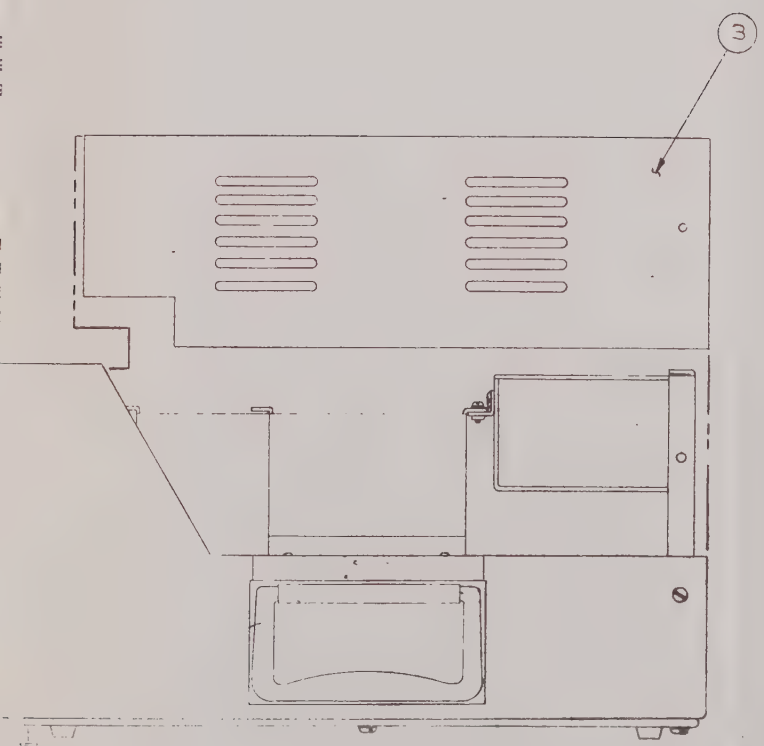
OCT 22 1979

DISPLAY I/O BOARD 96819

NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE, U.S.A.
DRAWN | CHECKED | APPROVED | SCALE | DATE | SHEET
SIZE D


11
10
9
8
7
H
D
C
B
A
8-32 x .375 BH.
#8 LOCKWASHER
#8 FLATWASHER
2 PLACES
3 (REF)
2
INSTRUCTIONS
4

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0		9-22-77	SEN



OCT 22 1979

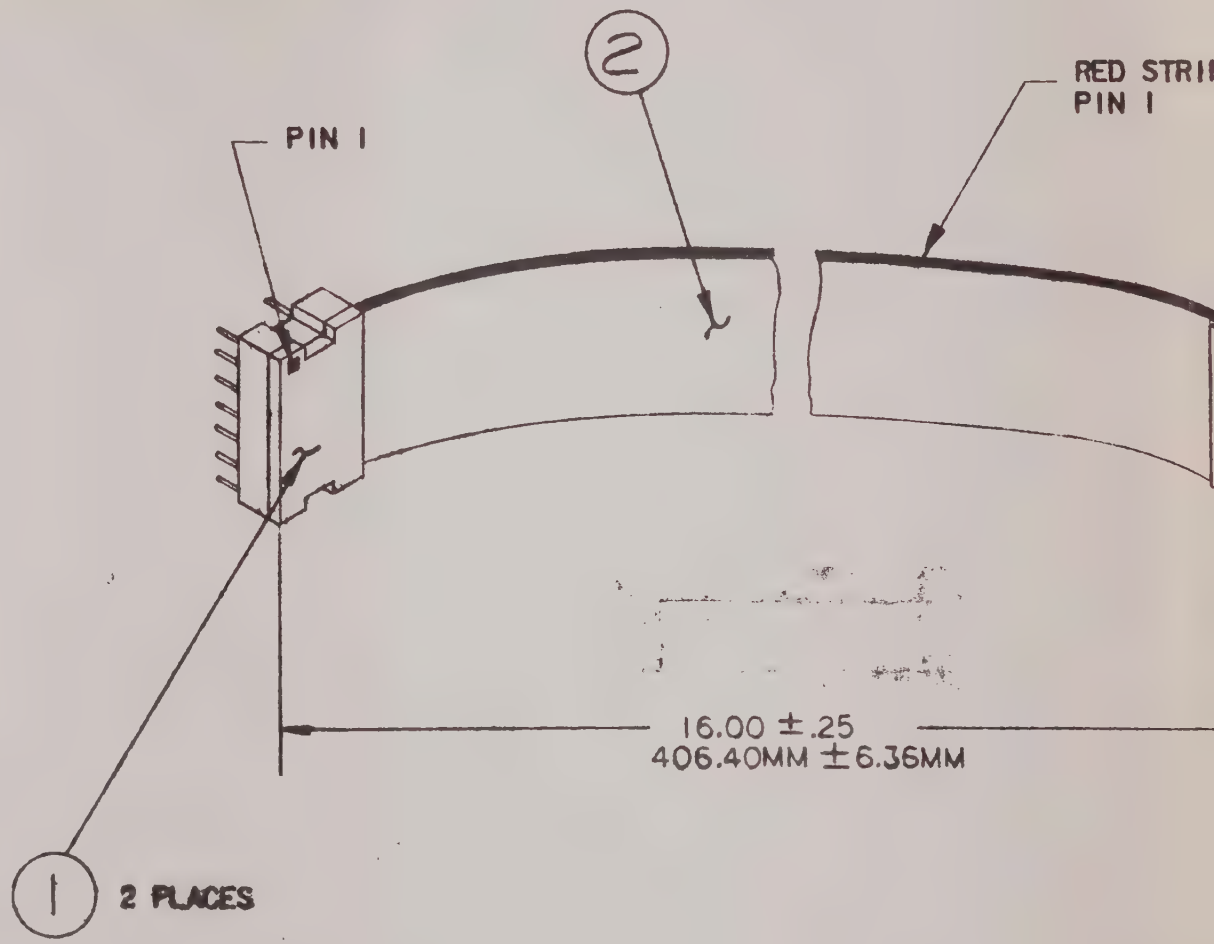
REPAIR

1. SERIAL NUMBER TAG PINNED ABOVE PAN PANEL.

NOTES:

6-32 x .375 BH. SCR.
6 LOCKWASHER
6 FLATWASHER
7 PLACES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES	TITLE	NORTHEAST ELECTRONICS
ALL TOLERANCES ARE ± .010	MODEL 41-3A FINAL ASSEMBLY	
ALL ANGLES ARE 90° ± ½°		
BEND RADIUS AS FOLLOWS MATL .09 OR LESS 1/64 RAD MATL .125 1/32 RAD		DRAWN TAGF DATE 7-6-77
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT		CHECKED DATE
		APPROVED DATE
		SIZE D NUMBER 0041-13-900

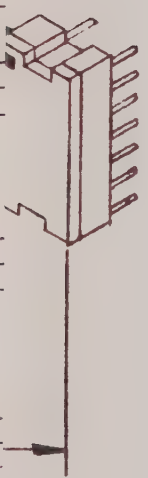


UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .01
ALL BENDS ARE 90° ± 1/2°
BEND RADIUS AS FOLLOWS MATL .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	CHG. DIM. FROM INSIDE TO OUTSIDE S/661 (322) P.R.	7/2/79	JAB

DENOTES



REPAIR

OCT 22 1979

1. ALL DIMENSIONS IN MM ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

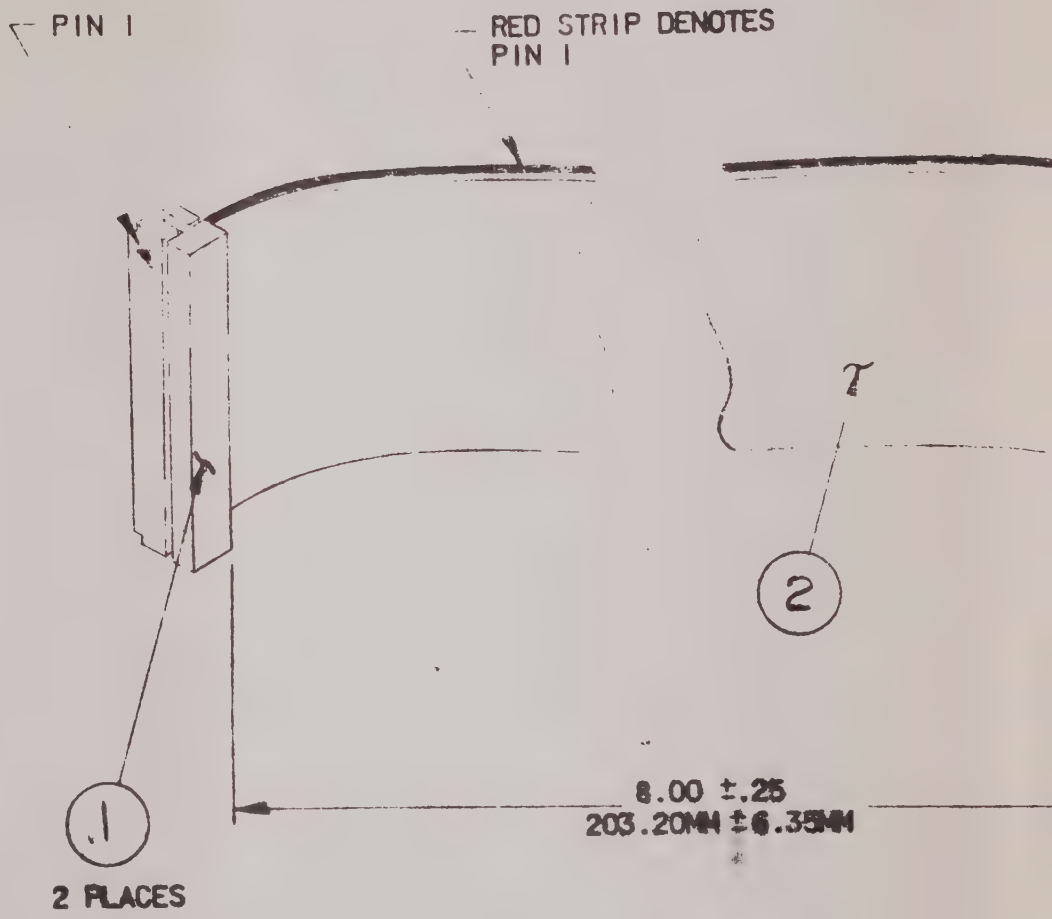
NOTES

TITLE

FLAT CABLE (16 LONG)

NORTHEAST ELECTRONICS nt

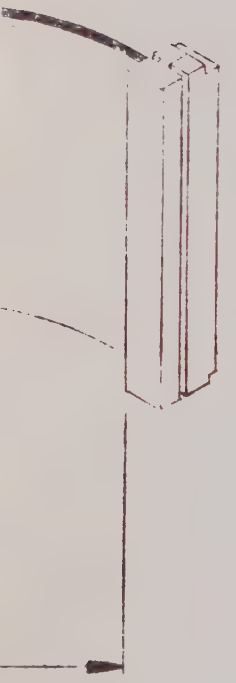
~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MC DATE 9-21-77 SCALE —
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34 3003 H14~~	CHECKED DLC DATE 9-21-77
~~R AND S VINYL 8080, W24~~		APPROVED SKN DATE 9-22-77
~~SCREEN PER~~		SIZE B NUMBER 0041-13-036 ISSUE 1



UNLESS OTHERWISE SPECIFI DIMENSIONS ARE IN INCHE
ALL TOLERANCES ARE ± .0
ALL BENDS ARE 90° ± 1/2°
BEND RADIUS AS FOLLOW MAT'L .09 OR LESS, 1/64 RA MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN



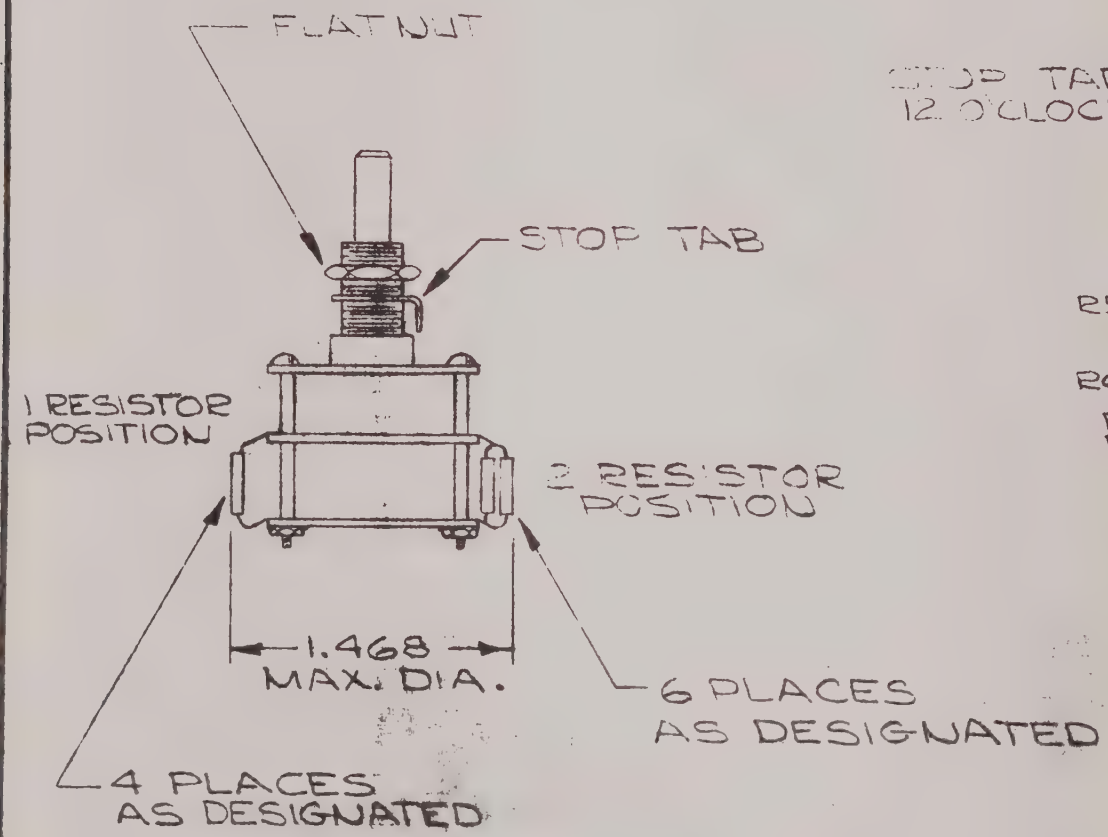
OCT 22 1979

REPAIR

1. ALL DIMENSIONS IN MM ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

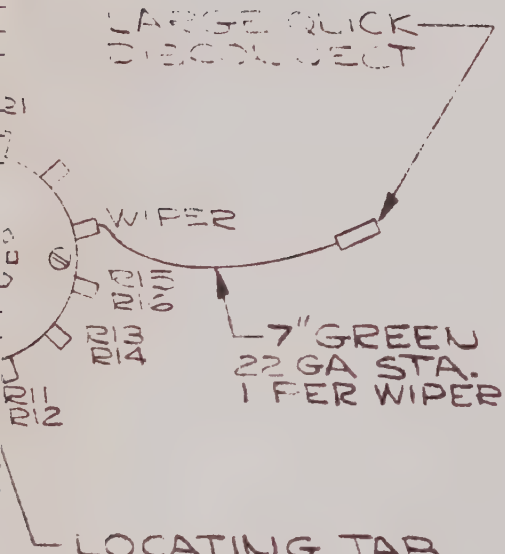
NOTES

TITLE: FLAT CABLE (50 SHORT)		NORTHEAST ELECTRONICS int — CONCORD NEW HAMPSHIRE U.S.A.
~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF DATE 5/31/77 SCALE ~
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34 3003 H14~~	CHECKED D.P. DATE 7-13-77
~~R AND S VINYL 8050, W24~~		APPROVED SKN DATE 7-21-77
~~SCREEN PER~~		SIZE B NUMBER 0041-13-035 ISSUE 0



UNLESS OTHERWISE SPECIF DIMENSIONS ARE IN INCH
ALL TOLERANCES ARE ±
ALL BENDS ARE 90° ± 1/
BEND RADIUS AS FOLLOW MAT'L .09 OR LESS, 1/64 R MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGE DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
	ADDED NOTE 1 S-136	1/11/78	[illegible]



OCT 22 1979

REPAIR

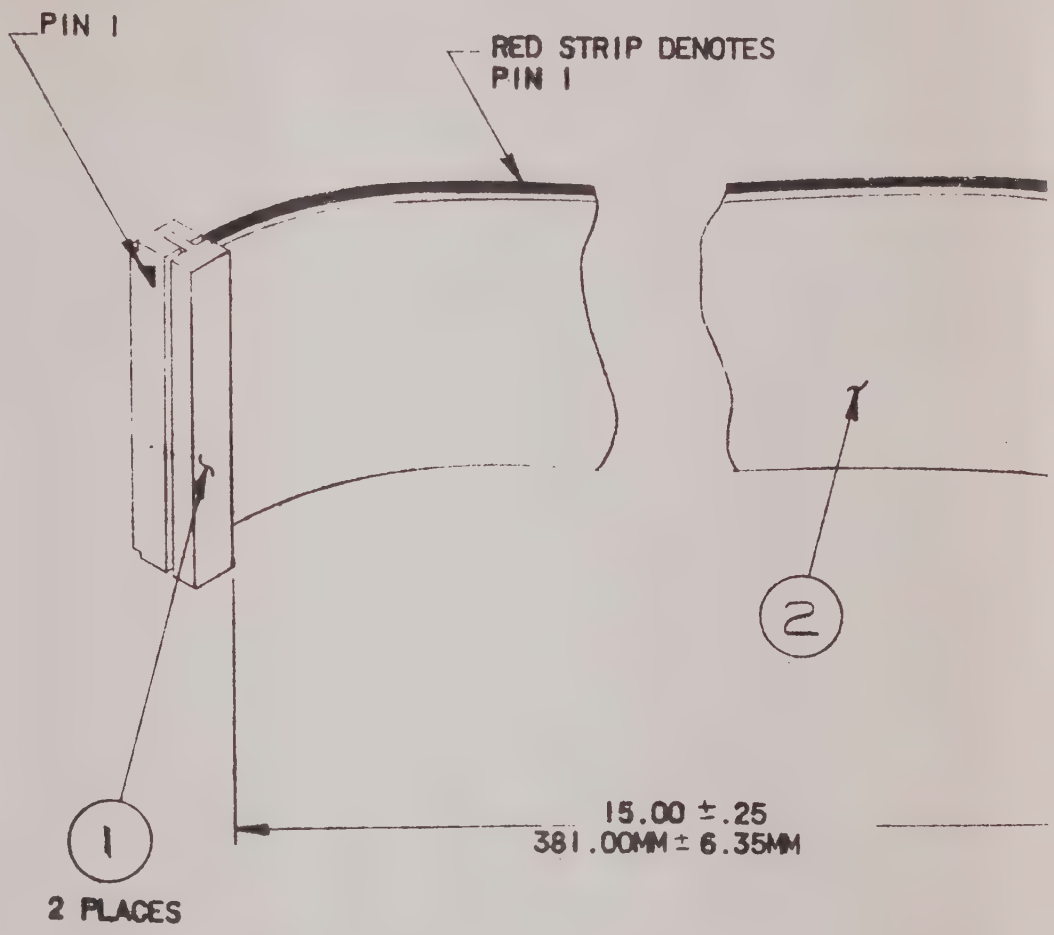
1. MOUNT COMPONENTS AS CLOSE TO SWITCH AS POSSIBLE.

NOTES

TITLE
HI LEVEL SWITCH ASS'Y

NORTHEAST ELECTRONICS nt
CONCORD, NEW HAMPSHIRE

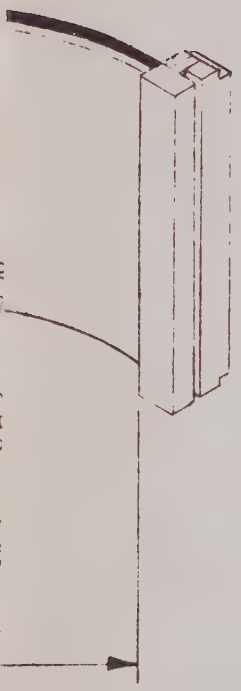
~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF	DATE 3/9/77 SCALE 2
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34~~ 3003 H14	CHECKED	DATE 7-13-77
R AND S VINYL ~~8050, W24~~		APPROVED SKN	DATE 7-21-77
~~SCREEN PER~~ SCHEMATIC 0041-13-331		SIZE B	NUMBER 0041-3-031 ISSUE 1



UNLESS OTHERWISE SPECIFIE DIMENSIONS ARE IN INCHE
ALL TOLERANCES ARE ± .0
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RA MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN



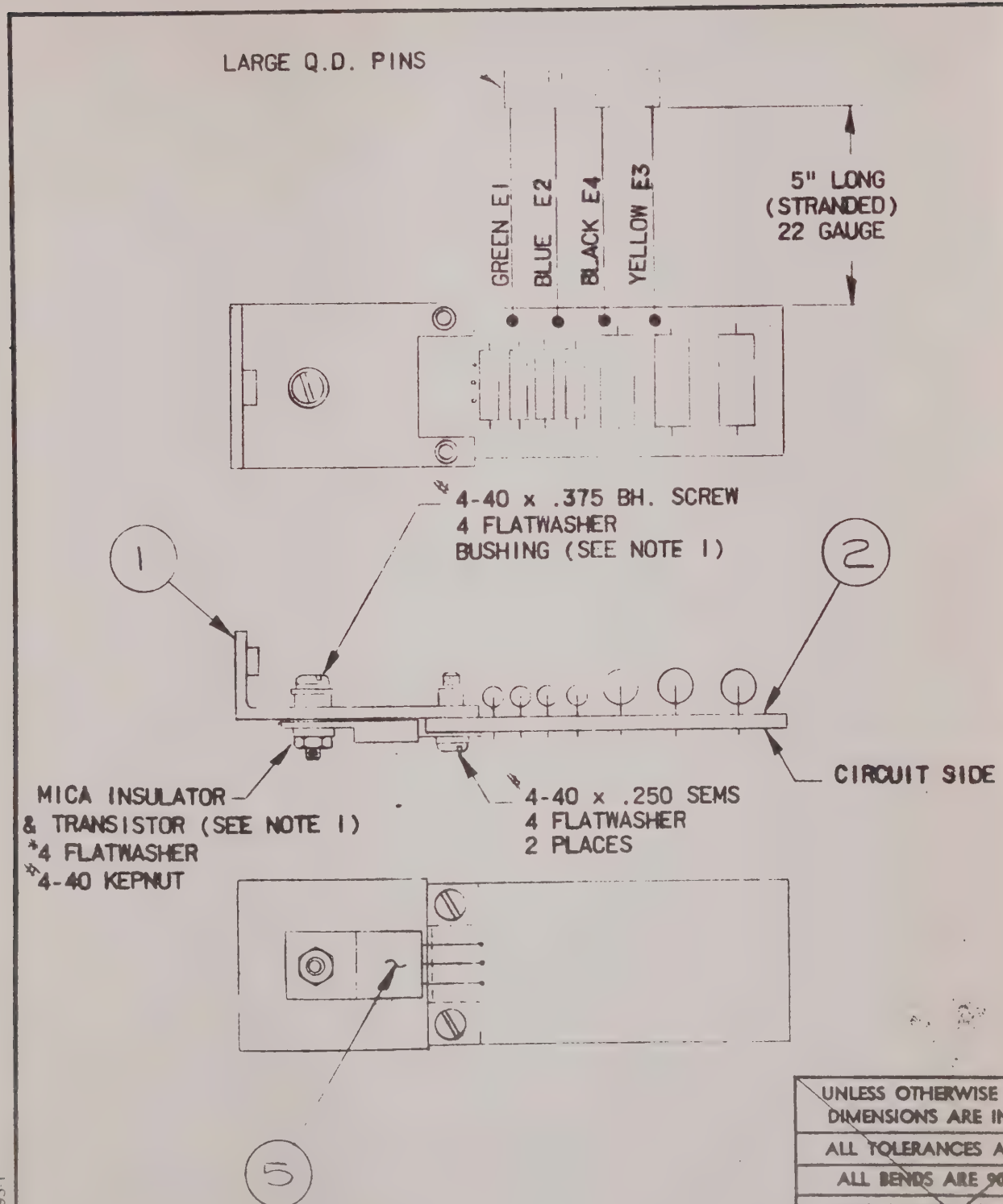
REPAIR

OCT 22 1979

1. ALL DIMENSIONS IN MM ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

NOTES

TITLE: FLAT CABLE (50 LONG)		NORTHEAST ELECTRONICS CORP. NEW HAMPSHIRE	
~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF	DATE 6/1/77 SCALE 2
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H24 3003 H14~~	CHECKED P.D.C.	DATE 7-13-77
~~R AND S VINYL 8050, W24~~		APPROVED SKN	DATE 9-21-77
~~SCREEN PER~~		SIZE B	NUMBER 0041-13-034 ISSUE 0



UNLESS OTHERWISE SPECI
DIMENSIONS ARE IN INC
ALL TOLERANCES ARE ±
ALL BENDS ARE 90° ± 1
BEND RADIUS AS FOLLO
MAT'L .09 OR LESS, 1/64
MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDG
DEBUR ALL HOLES
SAND ALL SURFACES
WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL	9-22-77	SLN
	[illegible] 1059 [illegible]	6/11/79	J B C

REPAIR

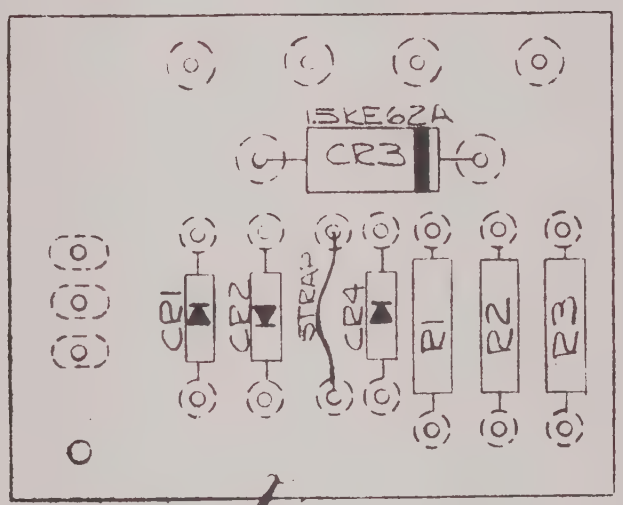
OCT 22 1979

2. SILICONE GREASE BOTH SIDES OF MICA INSULATOR BEFORE ASSEMBLY.

1. POWER TRANSISTOR, BUSHING AND MICA INSULATOR ALL COME UNDER PART Nº 552000323.

NOTES

FIED / HES	TITLE: SLEEVE HOLDING CIRCUIT OVERALL ASSY	NORTHEAST ELECTRONICS nt CONCORD, NEW HAMPSHIRE, U.S.A.	
.015			
½°			
WS / RAD	~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF DATE 7/1/77 SCALE
	~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34 3003 H14~~	CHECKED [illegible] DATE 7-13-77
ES	~~R AND S VINYL 8050, W24~~		APPROVED [illegible] DATE 7-21-77
	~~SCREEN PER~~		SIZE B NUMBER 00[illegible]-13-033 ISSUE 1



P.C. BOARD 96641

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .01
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0		9-22-77	SKN

REPAIR

OCT 22 1979

1. SINGLE SIDED CIRCUI[illegible] COMPONENTS MOUNTED TO BOARD ON SIDE SHOWN [illegible] SIDE HAS CIRCUITRY AND WIRING.

NOTES

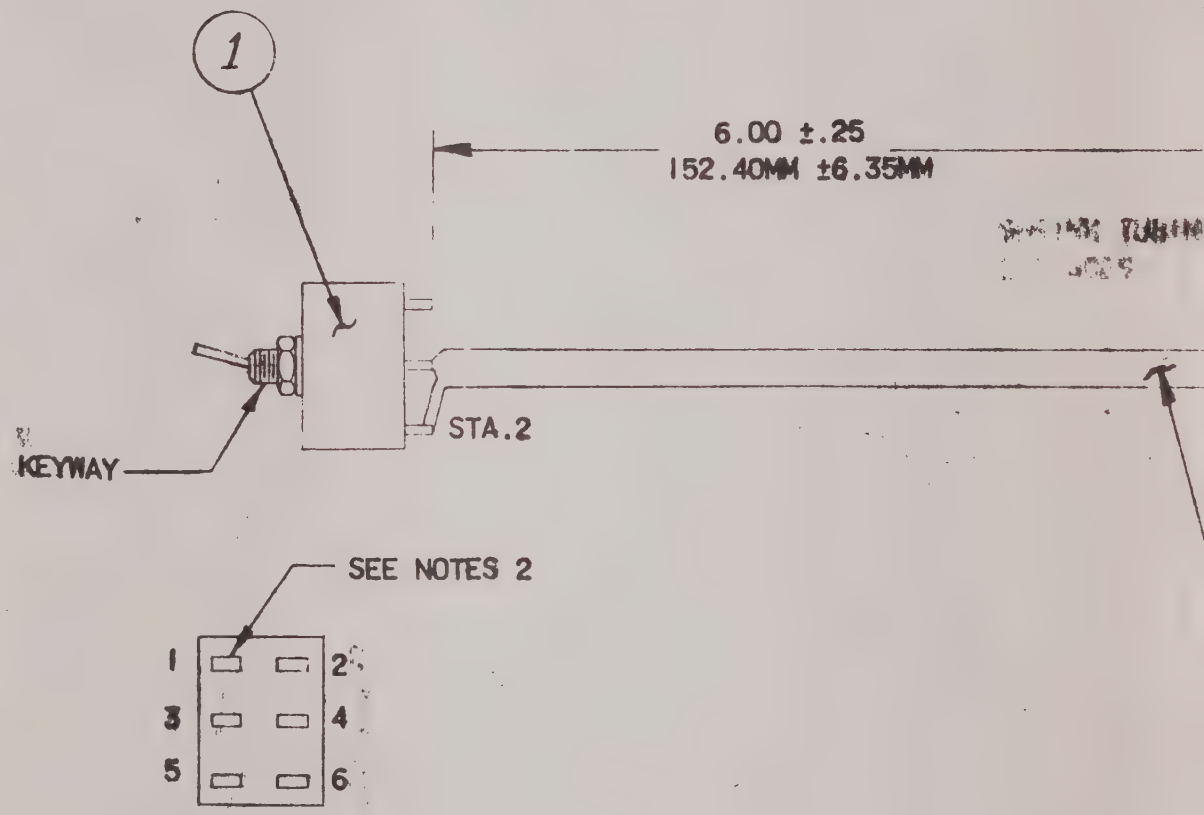
TITLE
SLEEVE HOLDING
CIRCUIT P.C. BD 96641

FINISH — ETCH AND IRIDITE	MATERIAL
PAINT — FEDERAL SPEC. 595 COLOR 26492	ALUMINUM 5052 H34 3003 H14
R AND S VINYL 8050, W24	
SCREEN PER SCHEMATIC [illegible]	

NORTHEAST ELECTRONICS nt northern telecom

DRAWN MCF	DATE 9/1/77	SCALE —
CHECKED [illegible]	DATE 7-13-77	
APPROVED SKN	DATE 9-21-77	

SIZE	NUMBER	ISSUE
B	0041-13-032	0



WIRE LIST

FROM	TO	COLOR	GA	LENGTH
STA 1 PIN 1	STA 2 PIN 5	SLATE	22	6.00 ±.25
STA 1 PIN 2	STA 2 PIN 4	RED	22	6.00 ±.25
STA 1 PIN 3	STA 2 PIN 6	WHT/SLT	22	6.00 ±.25
STA 1 PIN 4	STA 2 PIN 3	GREEN	22	6.00 ±.25

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

ALL TOLERANCES ARE ± .015

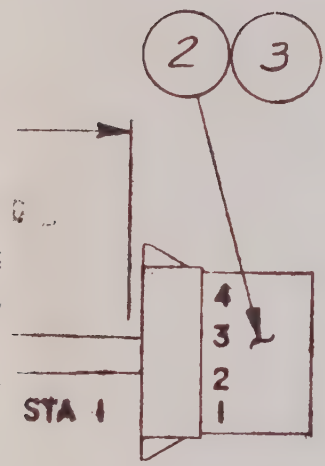
ALL BENDS ARE 90° ± ½°

BEND RADIUS AS FOLLOWS
MAT'L .09 OR LESS, 1/64 RAD
MATL .125, 3/32 RAD

BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES
WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible] ISSUE	9-22-77	[illegible]
1	CHNG NOTE 2. WIRE LIST 9/64 (F98)	[illegible]	[illegible]
2	CHNG NOTE 2, REMOVE SHRINK TUBING IN WIRE JACKET 10276 (F)	[illegible]	[illegible]



CLEAR TUBING

OCT 22 1979

2. INSULATE ALL WIRED PINS WITH CLEAR TUBING, UNUSED PINS WITH SHRINK TUBING.

1. ALL DIMENSIONS IN MM ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

REPAIR

NOTES

TITLE

POWER SWITCH ASSEMBLY

HC

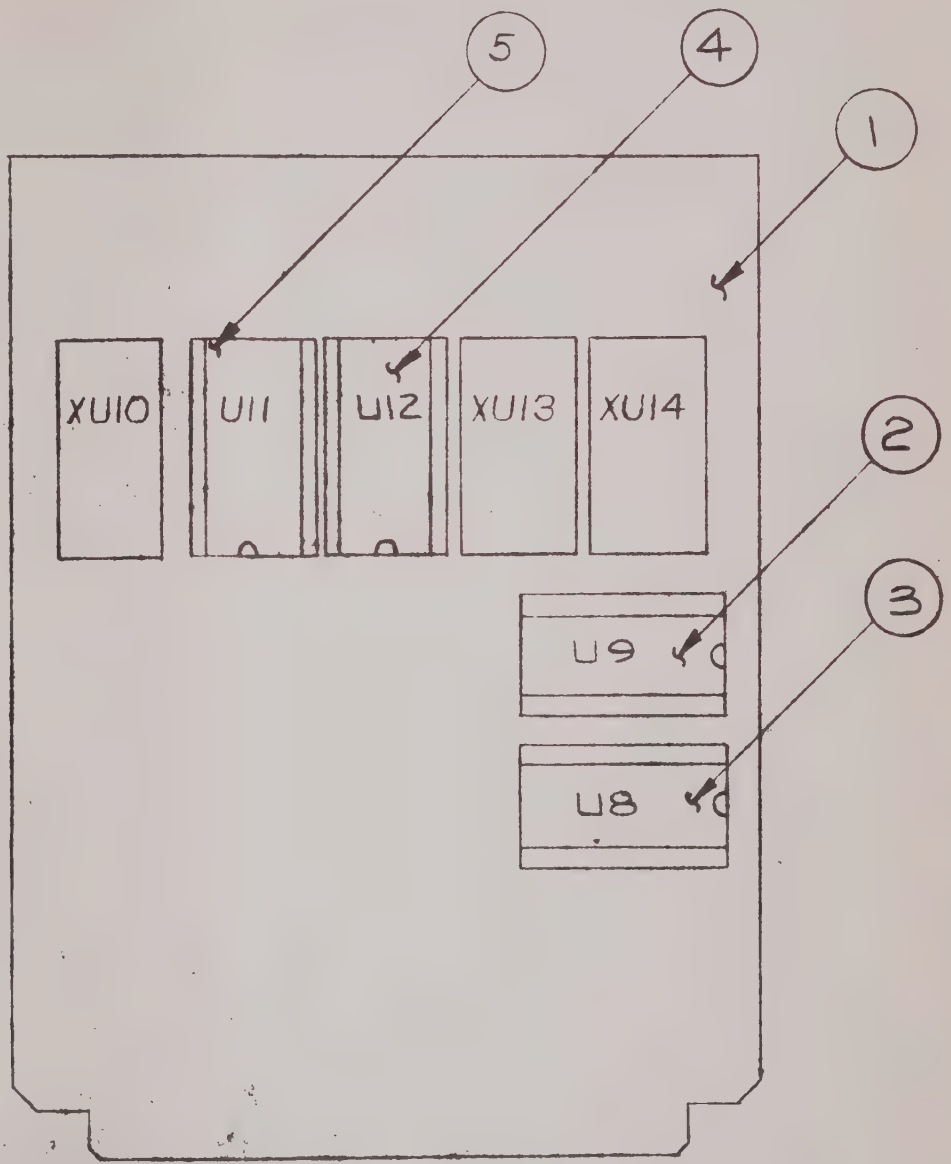
~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H24~~ ~~3003 H14~~	
~~R AND S VINYL 8050, W24~~		
~~SCREEN PER~~ SCHEMATIC PER B-0041-13-309		

NORTHEAST ELECTRONICS nt

CONCORD, NEW HAMPSHIRE

DRAWN MCF	DATE 6/9/77	SCALE
CHECKED	DATE 7/21/77	
APPROVED SKN	DATE 7-21-77	

SIZE	NUMBER	ISSUE
B	0041-13-043	2



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .01
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 26093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	ADDED U11 C% 5 (335)	10-31-77	SKN
2	NEW SOFTWARE % 39 (398)	1-9-79	SKN
3	P/L CHNG % 57 (219)	5-16-79	[illegible]

OCT 22 1979

REPAIR

.312 MAX.

NOTES

TITLE

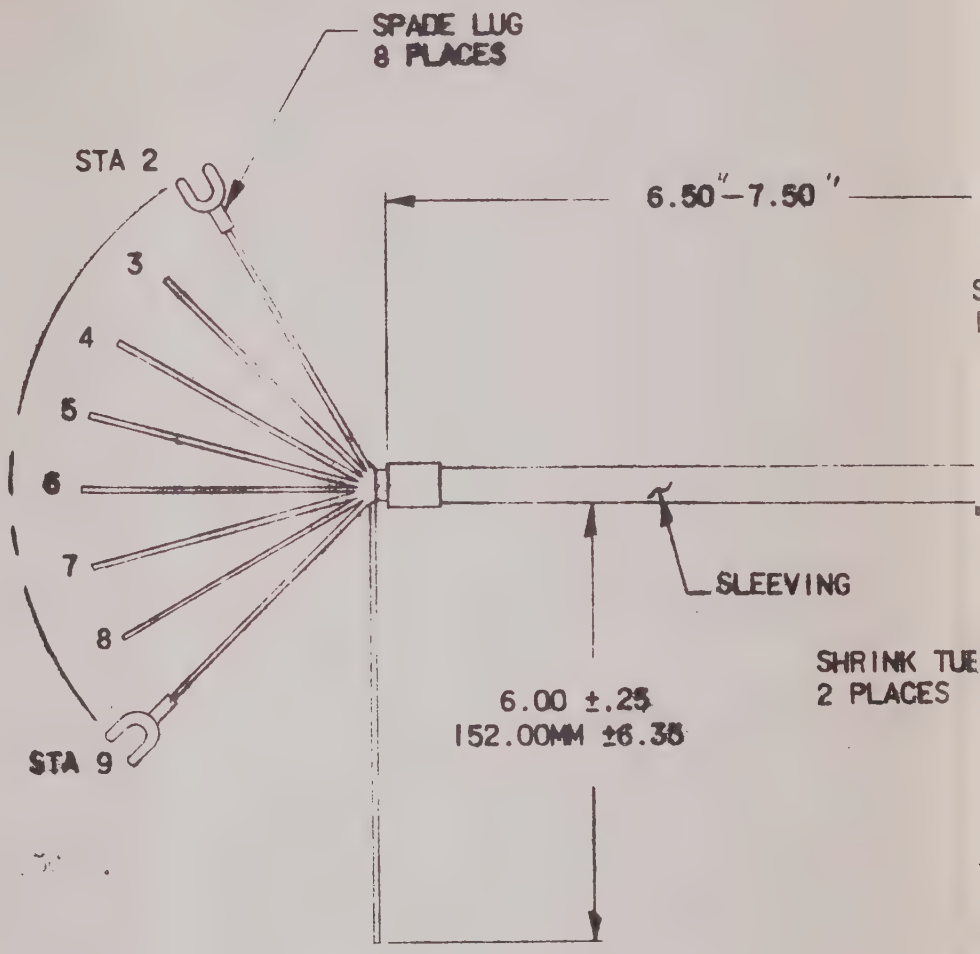
41-3A MEMORY CARD ASS'Y

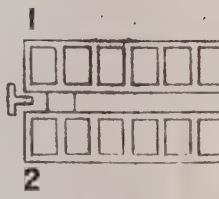
NORTHEAST ELECTRONICS

~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34~~	
~~R AND S VINYL 8050, W24~~	~~3003 H14~~	
~~SCREEN PER~~		

DRAWN MCF	DATE 7/8/77	SCALE 1/1
CHECKED [illegible]	DATE 7-13-77	
APPROVED SKN	DATE 7-21-77	

SIZE	NUMBER	ISSUE
B	0041-13-041	3





VIEW A-A

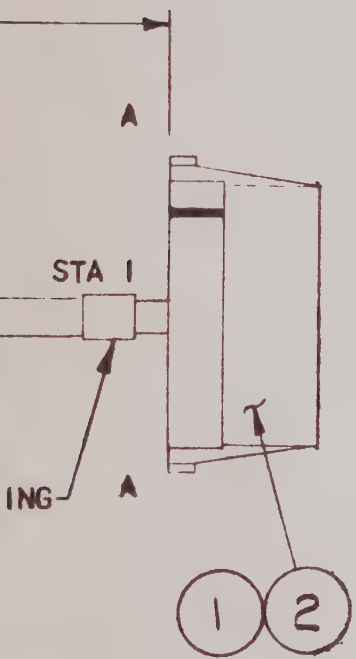
WIRE LIST

FROM	TO	COLOR	GA	LENGTH
STA 1 PIN 2	STA 2	BLUE	18	11.00 ±.25
STA 1 PIN 4	STA 3	ORANGE	18	12.25 ±.25
STA 1 PIN 6	STA 4	RED	18	9.50±.25
STA 1 PIN 8	STA 5	GREEN	18	10.00 ±.25
STA 1 PIN 10	STA 6	BLACK	18	10.50 ±.25
STA 1 PIN 12	STA 7	BLACK	18	10.00 ±.25
STA 1 PIN 14	STA 8	BLACK	18	9.50 ±.25
STA 1 PIN 15	STA 10	BLACK	18	14.00 ±.25
STA 1 PIN 16	STA 9	BLACK	18	11.50 ±.25

UNLESS OTHERWISE SPECIF
DIMENSIONS ARE IN INCH
ALL TOLERANCES ARE ±
ALL BENDS ARE 90° ± ½
BEND RADIUS AS FOLLOW
MAT'L .09 OR LESS, 1/64 R
MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES
WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	STA 1 PIN 2 WAS PIN 1 %12 369	1-13-78	SKN
2	CHNG. WIRE LENGTHS %19 469	8-25-78	



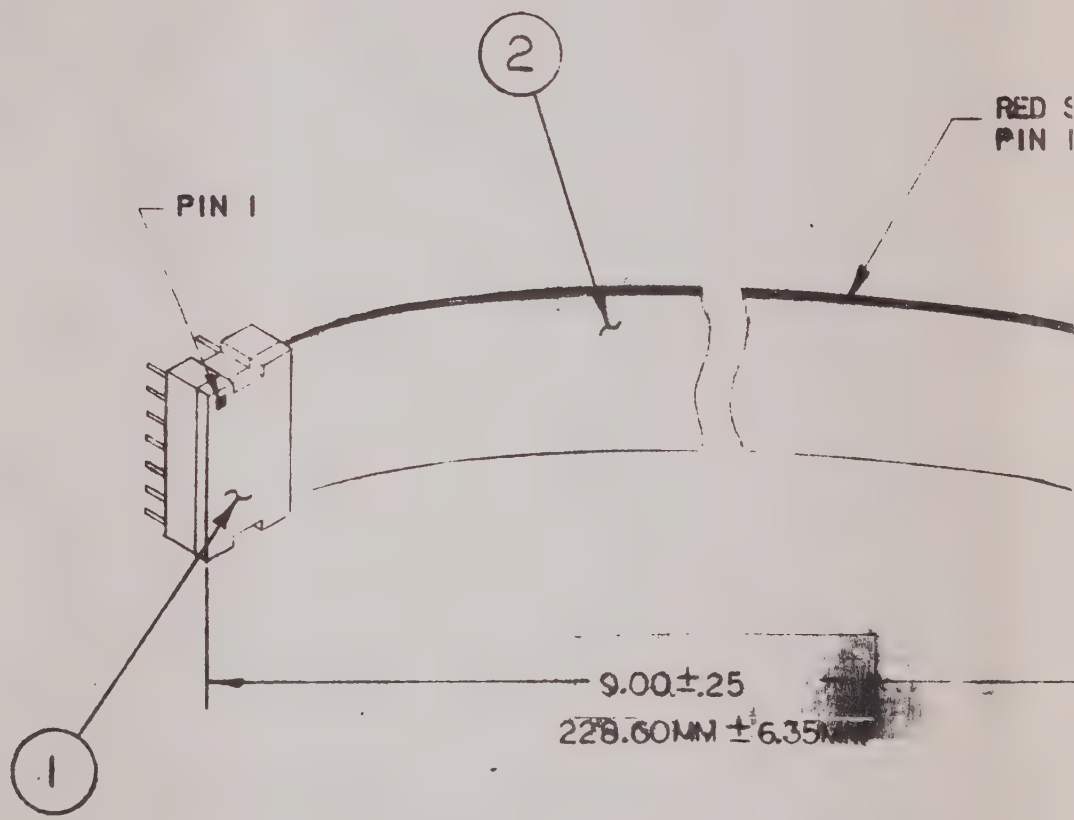
OCT 22 1979

REPAIR

1. ALL DIMENSIONS IN MM ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

NOTES

TITLE: CABLE DC			NORTHEAST ELECTRONICS	
			DRAWN MCF DATE 6/9/77	SCALE
~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~		CHECKED	DATE 7-12-77
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34 3003 H14~~		APPROVED SKN	DATE 7-21-77
~~R AND S VINYL 8060, W24~~			SIZE B	NUMBER 0041-13-040
~~SCREEN PER~~				ISSUE 2

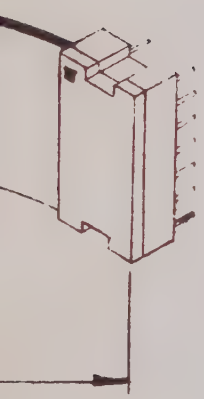


UNLESS OTHERWISE SPECI DIMENSIONS ARE IN INCH
ALL TOLERANCES ARE ±
ALL BENDS ARE 90° ± 1/
BEND RADIUS AS FOLLOV MAT'L .09 OR LESS, 1/64 R MATL .125, 3/32 RAD
BREAK ALL SHARP EDGE DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible] Issue	7-22-77	[illegible]
1	CHG DIM. FROM INSIDE TO OUTSIDE S/O 41 322) PRL	7-[illegible]	[illegible]

TRIP DENOTES



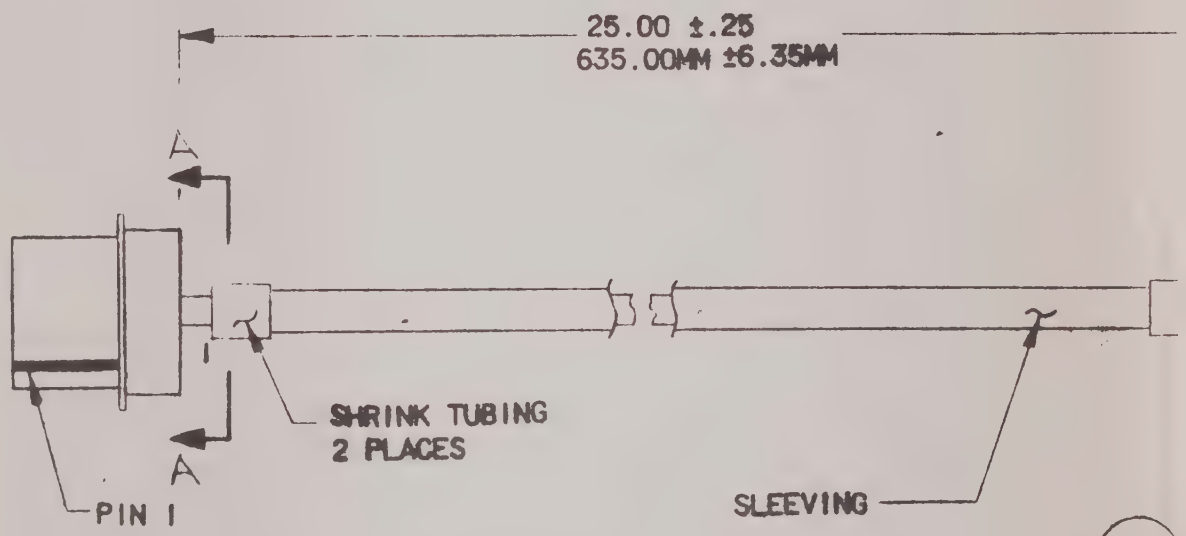
REPAIR

OCT 22 1979

1. ALL DIMENSIONS IN MM ARE ±.38MM UNLESS OTHERWISE SPECIFIED.

NOTES

ED ES 018	TITLE: FLAT CABLE (16 SHORT)		NORTHEAST ELECTRONICS CORP. CONCORD, NEW HAMPSHIRE		
S AD	~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF	DATE 5/31/77	SCALE —
	~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34 3003 H14~~	CHECKED [illegible]	DATE 7-13-77	
	~~R AND S VINYL 8050, W24~~		APPROVED [illegible]	DATE 7-21-77	
	~~SCREEN PER~~		SIZE B	NUMBER 0041-13-038	ISSUE 1



VIEW A A

WIRE LIST

FROM	TO	COLOR	GA	LENGTH
STA.1 PIN 1	STA.2 PIN 1	SLATE	22	25.00
STA.1 PIN 2	STA.2 PIN 2	RED	22	25.00
STA.1 PIN 3	STA.2 PIN 3	SLATE	22	25.00
STA.1 PIN 4	STA.2 PIN 4	GREEN	22	25.00

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES

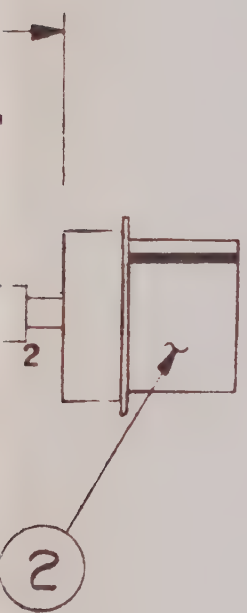
ALL TOLERANCES ARE ± .015

ALL BENDS ARE 90° ± ½°

BEND RADIUS AS FOLLOWS
MAT'L .09 OR LESS, 1/64 RAD
MATL .125, 3/32 RAD

BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES
WITH FINE GRIT

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	[illegible]



ACES

3. ALL WIRE STRANDED

OCT 22 1979

2. ADD 1 INCHE TO EACH STATION FOR ROUTING AND STRIPPING.

1. ALL DIMENSIONS IN MM ARE ± .38MM UNLESS OTHERWISE SPECIFIED.

NOTES

REPAIR

TITLE

CABLE 39

H.C.

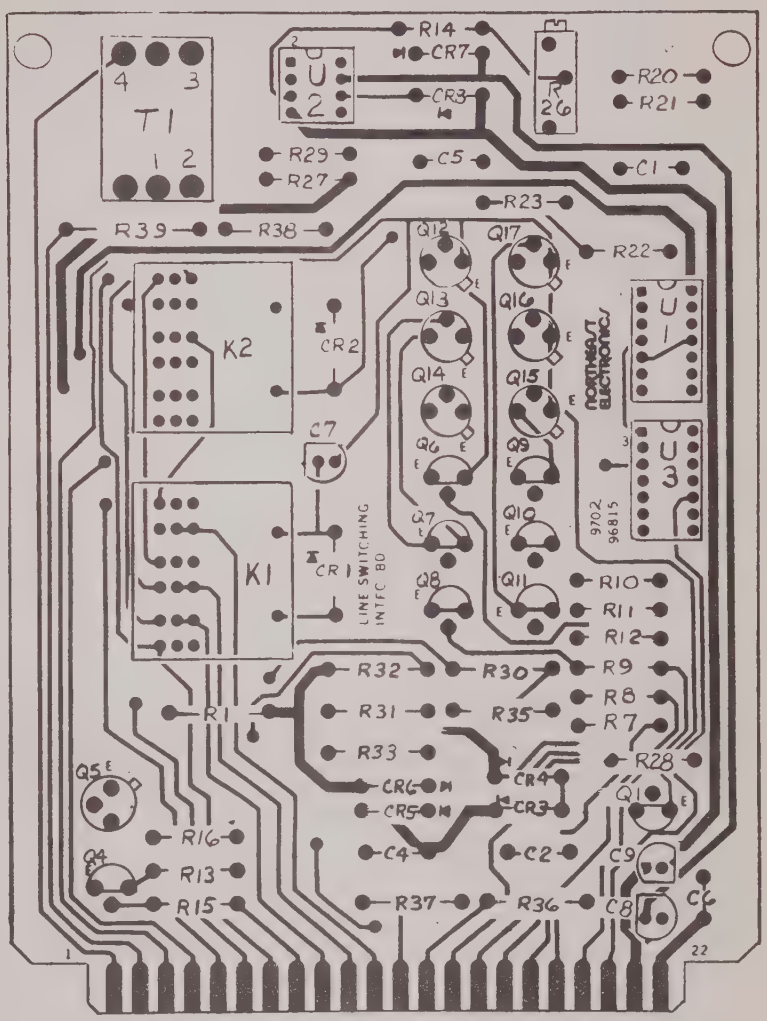
~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34~~	
~~R AND S VINYL 8050, W24~~	~~3003 H14~~	
~~GREEN PER~~		

NORTHEAST ELECTRONICS Int

NEW HAMPSHIRE

DRAWN MCF	DATE 5/31/77	SCALE 2
CHECKED [illegible]		DATE 7-13-77
APPROVED SKN		DATE 7-21-77

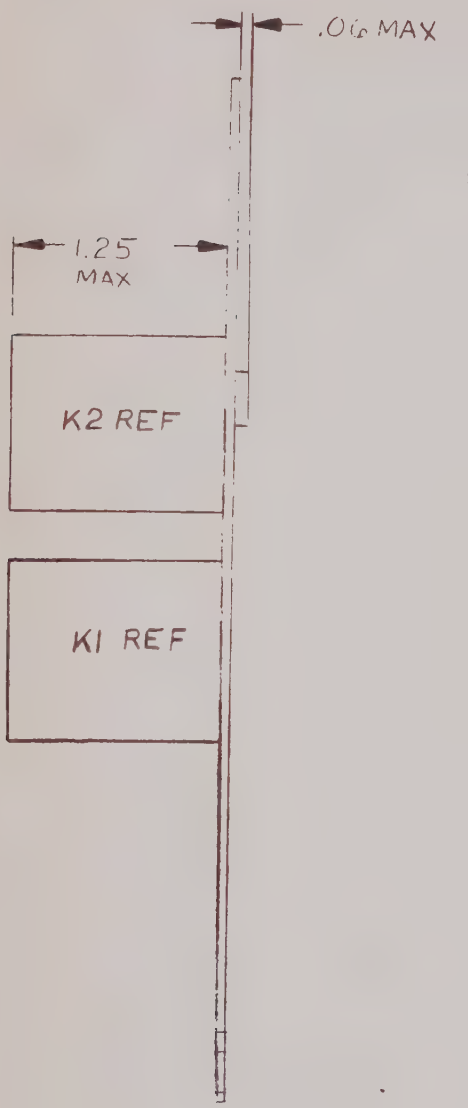
SIZE	NUMBER	ISSUE
B	0041-13-039	0



UNLESS OTHERWISE SPECIF DIMENSIONS ARE IN INCH
ALL TOLERANCES ARE ±
ALL BENDS ARE 90° ± ½
BEND RADIUS AS FOLLOV MAT'L .09 OR LESS, 1/64 R MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGE DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 28093 1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	P/L CHANGES PER C10810 (383)	1-9-78	SKN



REPAIR

OCT 22 1979

NOTES:

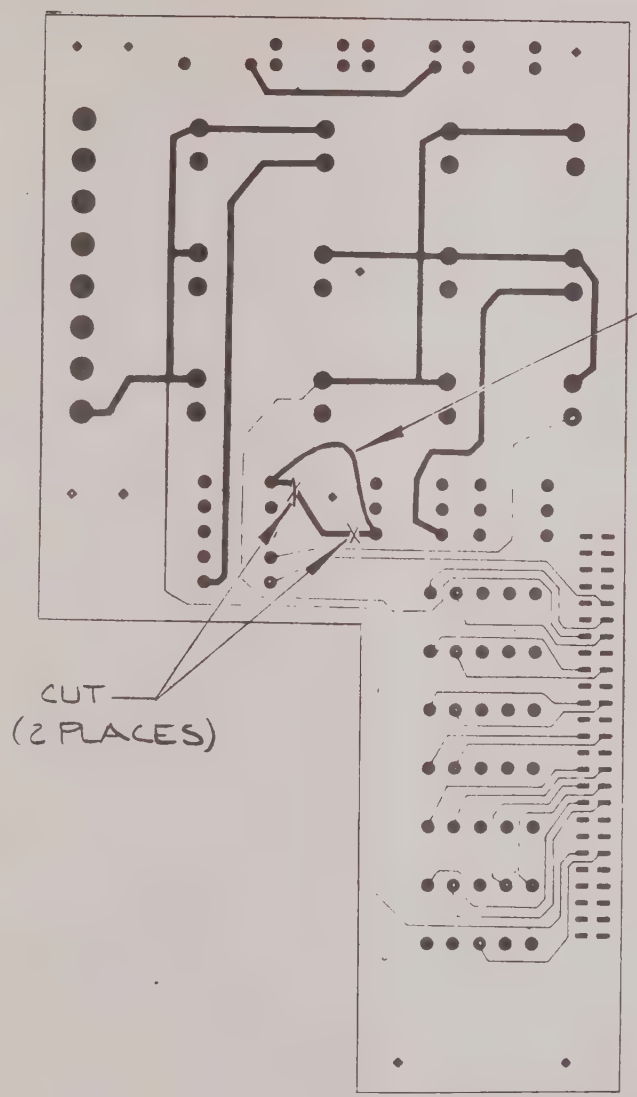
TITLE: LINE SW INTFC Bd
PRACTICAL ASSY
96815

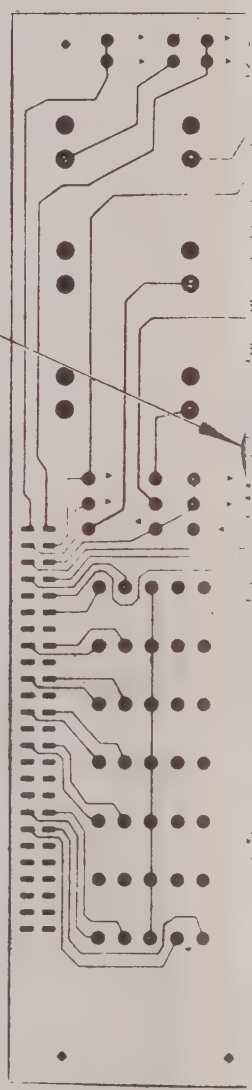
FINISH — ETCH AND IRIDITE	MATERIAL
PAINT — ~~FEDERAL SPEC. 595~~ COLOR ~~26492~~	ALUMINUM ~~5052 H34~~ 3003 H14
R AND S VINYL ~~8050, W24~~	
SCREEN PER 0041-13-319	

NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN	DATE 3/5/77	SCALE 1/1
CHECKED		DATE 7-13-77
APPROVED SKN		DATE 5-21-77

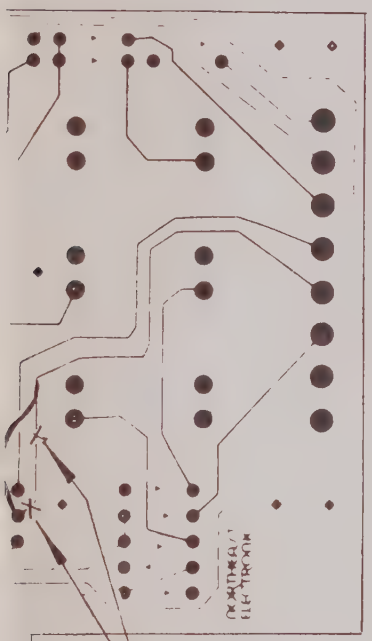
SIZE	NUMBER	ISSUE
B	0041-13-019	1





UNLESS OTHERWISE SPECIF
DIMENSIONS ARE IN INCH
ALL TOLERANCES ARE ± .
ALL BENDS ARE 90° ± 1/2
BEND RADIUS AS FOLLOW
MAT'L .09 OR LESS, 1/64 R/
MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES
WITH FINE GRIT

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL



CUT
(2 PLACES)

REPAIR

OCT 22 1979

NOTES

TITLE

KEYBOARD ASSY
96829

FINISH — ETCH AND IRIDITE	MATERIAL
PAINT —	ALUMINUM 5052 H32 3003 H14
SCREEN PER	

northern telecom

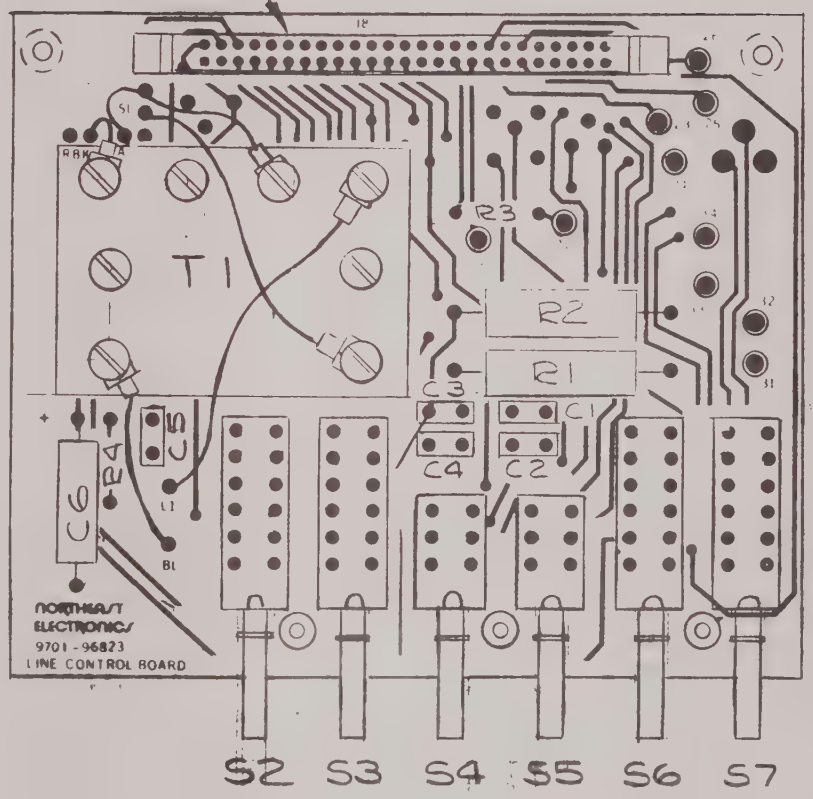
Northern Telecom Inc.

Northeast Electronics Division
P.O Box 649
Concord, New Hampshire 03301

DRAWN KLP	DATE 2.79	SCALE —
CHECKED P.D. [illegible]	DATE 79-09-04	
APPROVED M.A. Francis	DATE 4-6-79	

SIZE	NUMBER	ISSUE
B	0041-13-017	3

SHT 2 of 2



1.6
MA

TI
REF

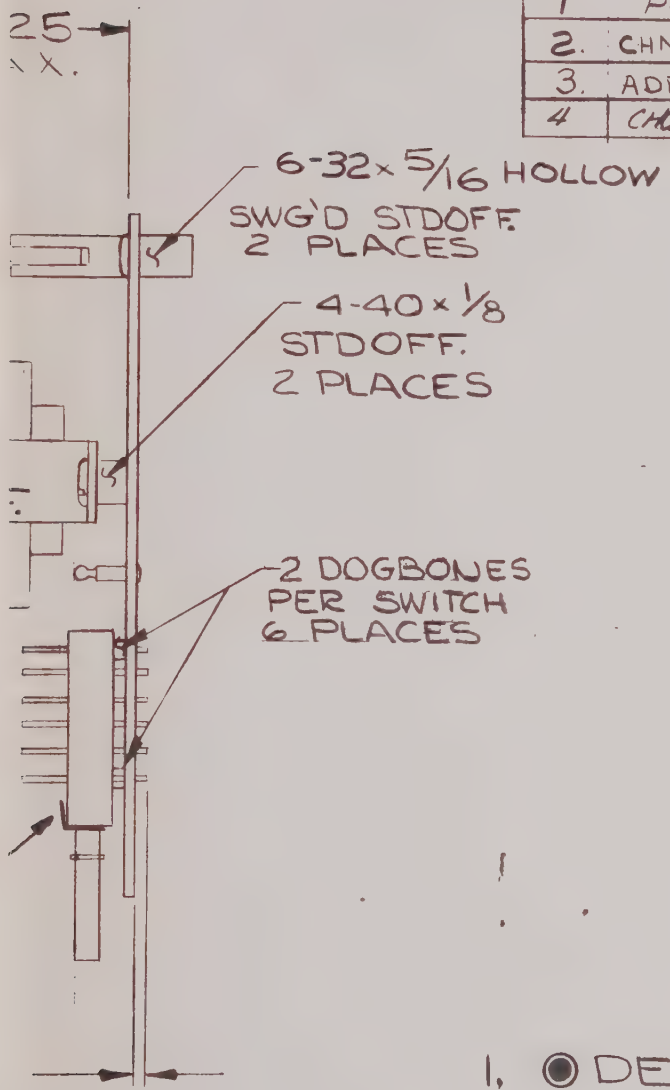
TABS TO
BE ON
TOPSIDE

.09 MAX.

UNLESS OTHERWISE SPECIFI DIMENSIONS ARE IN INCH
ALL TOLERANCES ARE ± .(
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOW MAT'L .09 OR LESS, 1/64 RA MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REV SIONS

NO	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	PC BD. CHNG %06 379	12/16/77	RBA
2.	CHNG. STD. OFFS %0 12 (369)	1-13-78	SKN
3.	ADDED ITEM 14 TO P.L. %0 22 (504)	4-7-78	SKN
4	CHG. DOGBONE TO 3/32 %0 23 (537)	5-9-78	RBA



REPAIR

OCT 22 1979

1. ◉ DENOTES LARGE MALE QUICK DISCONNECTS

NOTES

TITLE
LINE CONTROL BD.
ASS'Y 96823

~~FINISH — ETCH AND IRIDITE~~
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~
~~R AND S VINYL 8050, W24~~

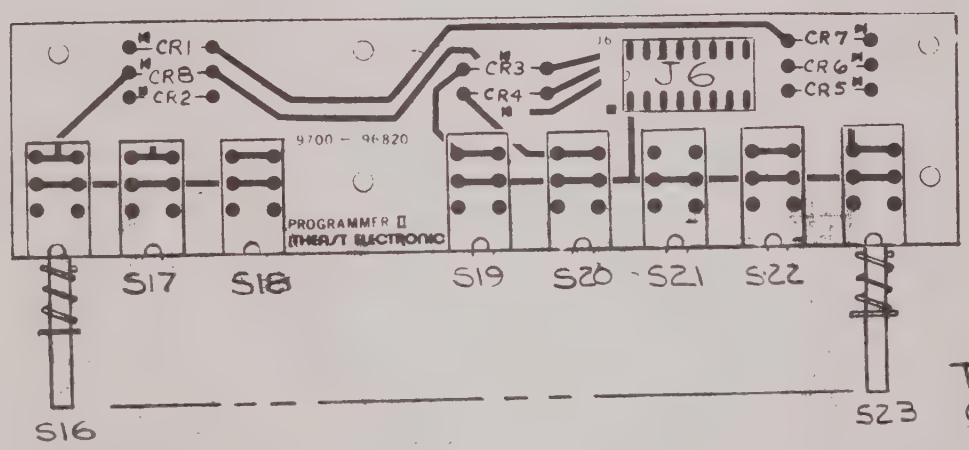
~~MATERIAL~~
~~ALUMINUM~~
~~5052 H34~~
~~3003 H14~~

~~SCREEN PER~~ SCHEMATIC 0041-13-3141

NORTHEAST ELECTRONICS
CONCORD NEW HAMPSHIRE U.S.A

DRAWN MCF	DATE 3/17/77	SCALE 1/1
CHECKED PPC		DATE 7-13-77
APPROVED SKN		DATE 7-21-77

SIZE	NUMBER	ISSUE
B	0041-13-014	4

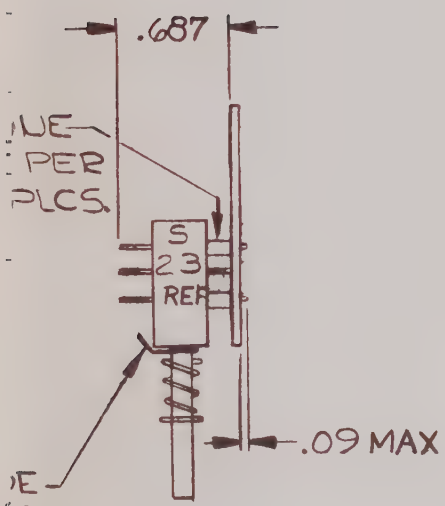


DOGBC
2PLCS
SW. 8

TAB TOPSID
OF SWIT
AS SHO

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	CHNGD PC BD 406 (379)	12/16/77	LBM
2	CHG. DOGBONE TO 1/8" 0023 (537)	5.9.78	LBM



OCT 22 1979

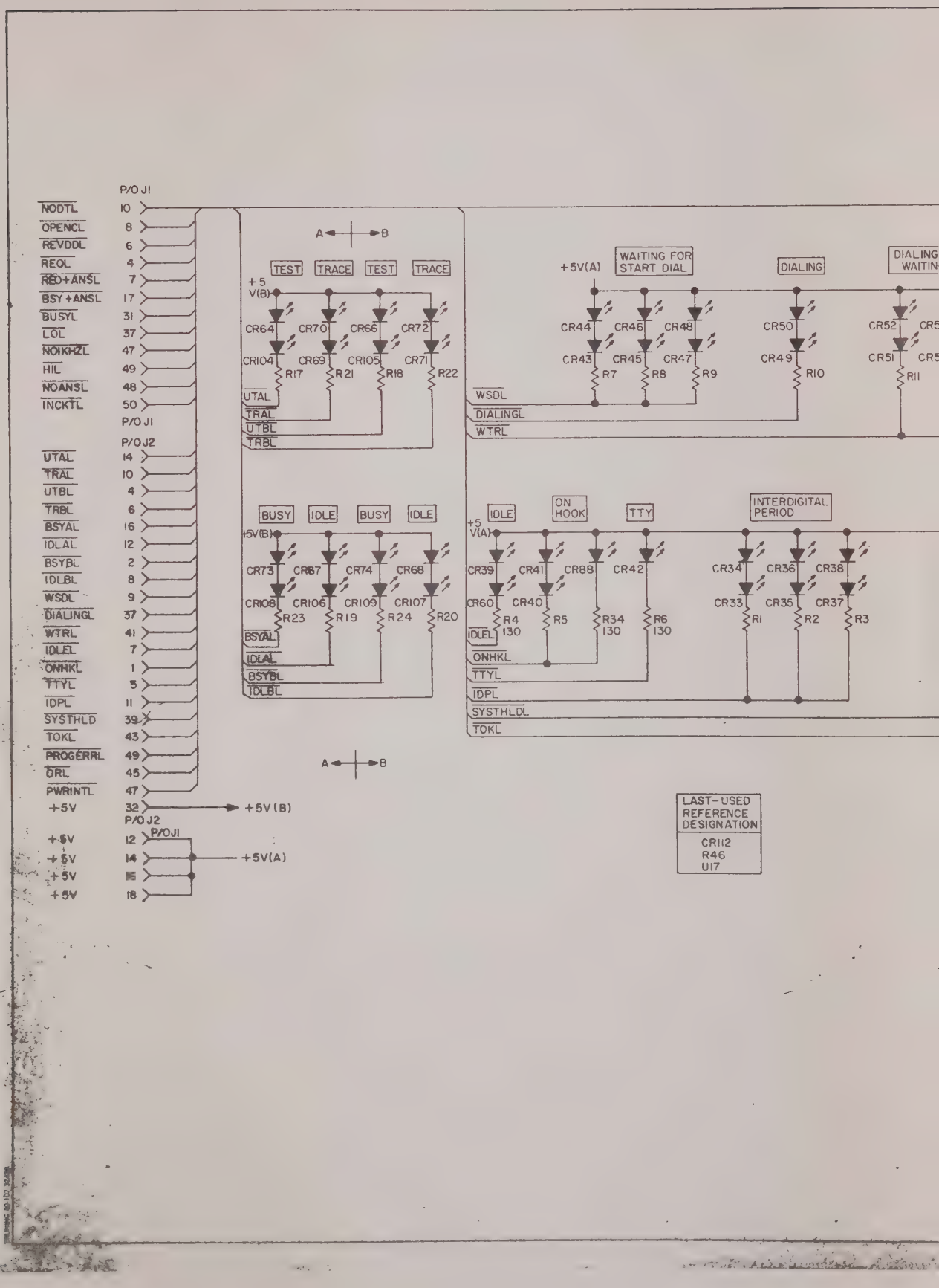
REPAIR

NOTES

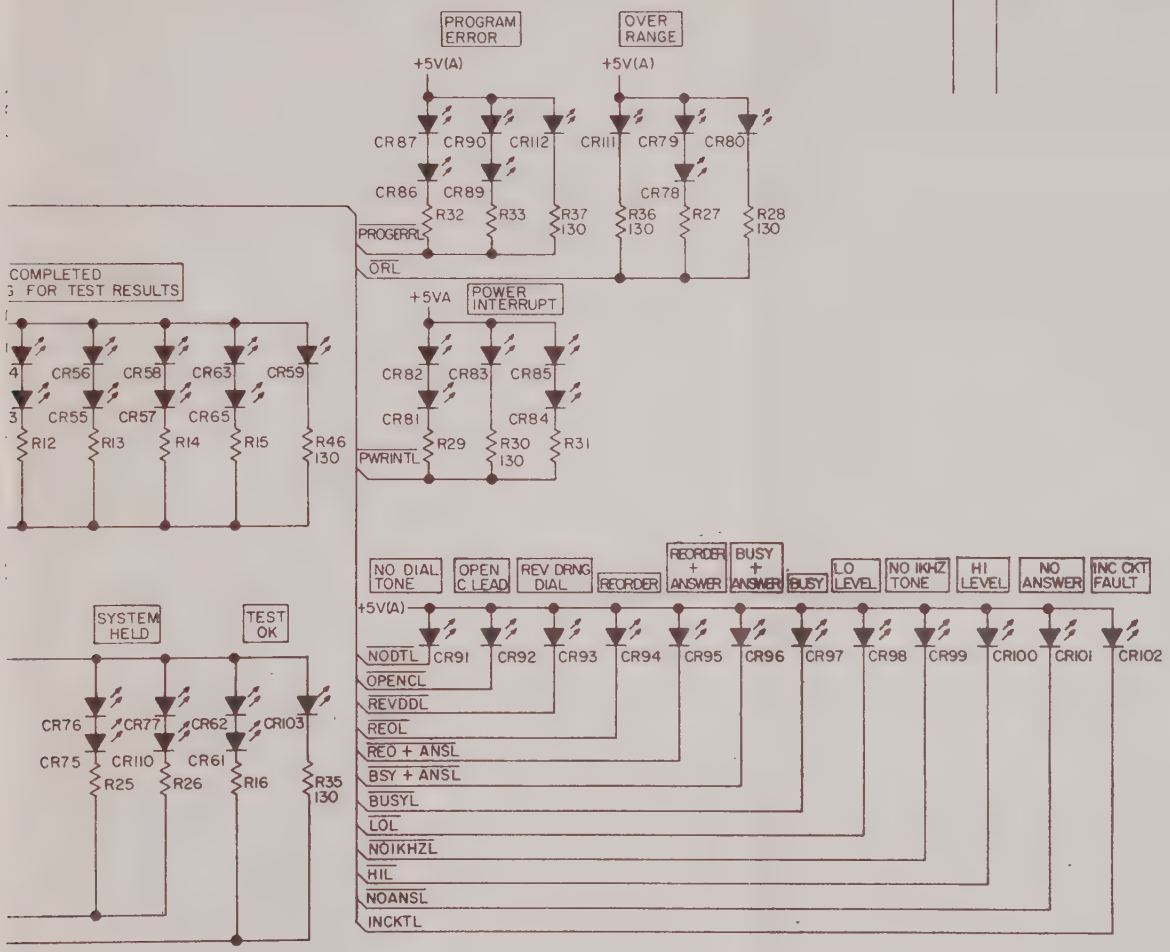
TITLE
PROGRAMMER II Bd
96820 ASSY

NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE

FINISH — ETCH AND IRIDITE	MATERIAL	DRAWN	DATE 5/10/77 SCALE 1/1
PAINT — FEDERAL SPEC. 595 COLOR 26492	ALUMINUM 5052 H34 3003 H14	CHECKED	DATE 7-13-77
R AND S VINYL 8050 W24		APPROVED SKN	DATE 7-21-77
GREEN PER SCHEMATIC D041-13-312		SIZE B	NUMBER 0041-13-012 ISSUE 2


P/O J1
NODTL 10
OPENCL 8
REVDDL 6
REOL 4
RED+ANSL 7
BSY+ANSL 17
BUSYL 31
LOL 37
NOIKHZL 47
HIL 49
NOANSL 48
INCKTL 50
P/O J1
P/O J2
UTAL 14
TRAL 10
UTBL 4
TRBL 6
BSYAL 16
IDLAL 12
BSYBL 2
IDLBL 8
WSDL 9
DIALINGL 37
WTRL 41
IDLEL 7
ONHKL 1
TTYL 5
IDPL 11
SYSTHLD 39
TOKL 43
PROGERRL 49
ORL 45
PWRINTL 47
+5V 32
+5V(B)
P/O J2
P/O J1
+5V 12
+5V 14
+5V 15
+5V 18
+5V(A)
A
B
TEST
TRACE
TEST
TRACE
+5 V(B)
CR64
CR70
CR66
CR72
CR104
CR69
CR105
CR71
R17
R21
R18
R22
UTAL
TRAL
UTBL
TRBL
BUSY
IDLE
BUSY
IDLE
+5V(B)
CR73
CR67
CR74
CR68
CR108
CR106
CR109
CR107
R23
R19
R24
R20
BSYAL
IDLAL
BSYBL
IDLBL
+5V(A)
WAITING FOR START DIAL
DIALING
DIALING WAITIN
CR44
CR46
CR48
CR50
CR52
CR43
CR45
CR47
CR49
CR51
R7
R8
R9
R10
R11
WSDL
DIALINGL
WTRL
IDLE
ON HOOK
TTY
INTERDIGITAL PERIOD
+5 V(A)
CR39
CR41
CR88
CR42
CR34
CR36
CR38
CR60
CR40
CR33
CR35
CR37
R4 130
R5
R34 130
R6 130
R1
R2
R3
IDLEL
ONHKL
TTYL
IDPL
SYSTHLDL
TOKL
LAST-USED REFERENCE DESIGNATION
CR112
R46
U17

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
2	PROGRAM. [illegible] 42 (532) [illegible]	3-2-79	[illegible]



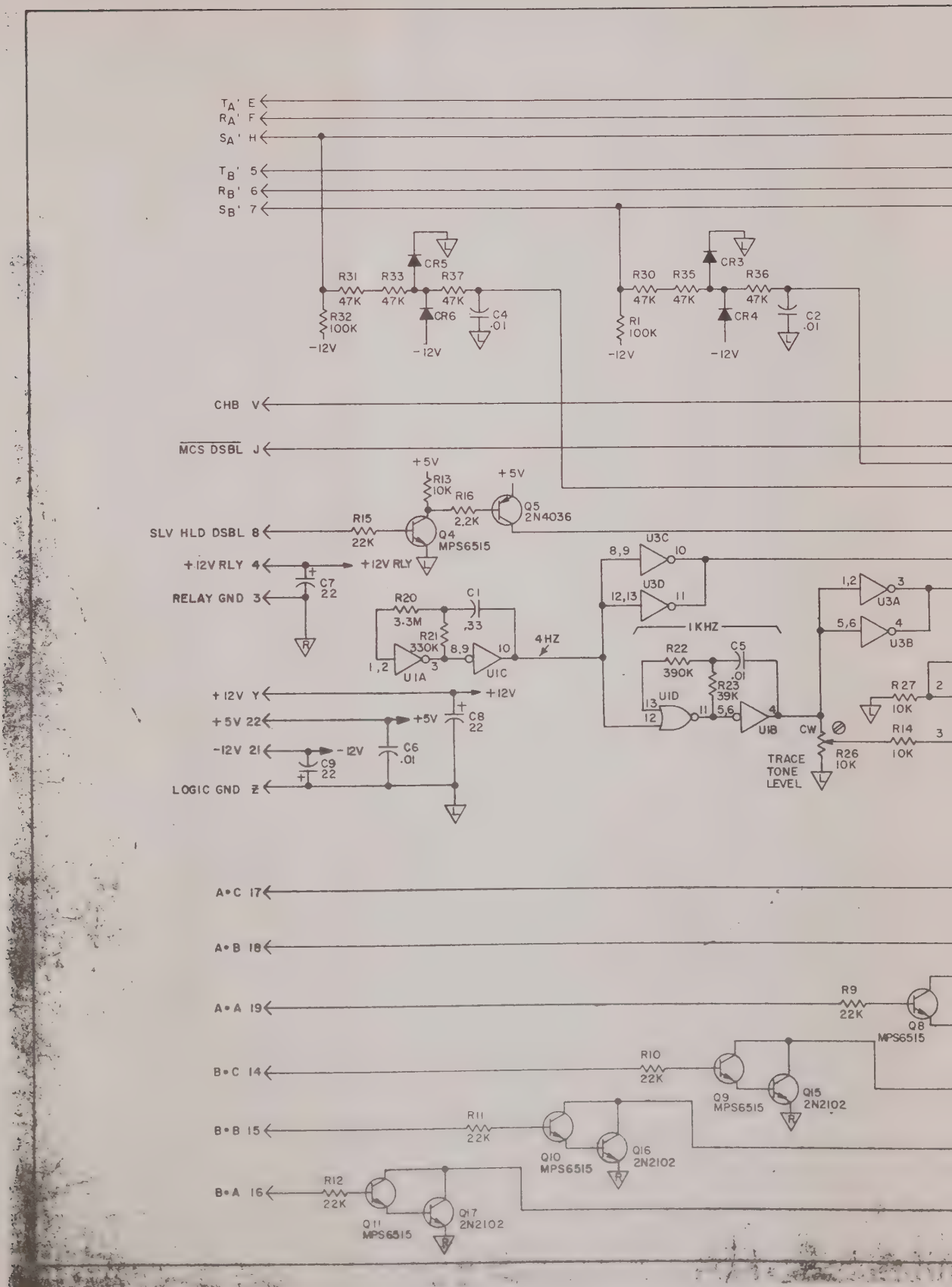
NOTES:
1. ALL RESISTORS 22 OHMS UNLESS OTHERWISE SPECIFIED.
2. LED'S
   CR33-CR90: 5082-4670
   CR91-CRI02: HLMP-1301
   CRI03-CRI12: 5082-4670

REPAIR
OCT 22 1979

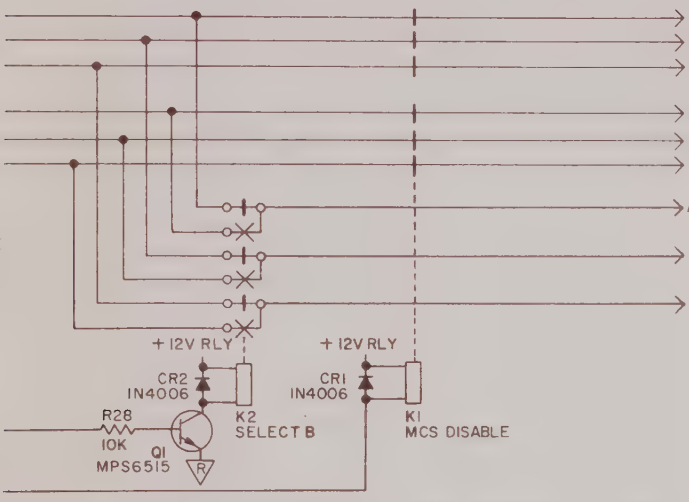
DISPLAY BOARD
96813 (SHEET 2 OF 2)

NORTHEAST ELECTRONICS Int
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN ANTAL	DATE 7-27-78	SCALE
CHECKED		DATE
APPROVED RTL		DATE 3-2
SIZE D	NUMBER 0041-13-3102	


TA' E
RA' F
SA' H
TB' 5
RB' 6
SB' 7
R31 47K
R33 47K
R37 47K
CR5
CR6
R32 100K
-12V
C4 .01
R30 47K
R35 47K
R36 47K
CR3
CR4
R1 100K
C2 .01
CHB V
MCS DSBL J
+5V
R13 10K
R16
2.2K
Q5 2N4036
SLV HLD DSBL 8
R15 22K
Q4 MPS6515
+12V RLY 4
+12V RLY
RELAY GND 3
C7 22
R20 3.3M
C1 .33
R21 330K
U1A
U1C
4HZ
U3C
U3D
1KHZ
U3A
U3B
R22 390K
C5 .01
R23 39K
U1D
U1B
CW
TRACE TONE LEVEL
R26 10K
R27 10K
R14 10K
+12V Y
+12V
+5V 22
C8 22
-12V 21
C6 .01
C9 22
LOGIC GND Z
A•C 17
A•B 18
A•A 19
R9 22K
Q8 MPS6515
B•C 14
R10 22K
Q9 MPS6515
Q15 2N2102
B•B 15
R11 22K
Q10 MPS6515
Q16 2N2102
B•A 16
R12 22K
Q11 MPS6515
Q17 2N2102

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
1	REDRAWN S/O 42 (532)	3-2-79	



13 S_B BFRD

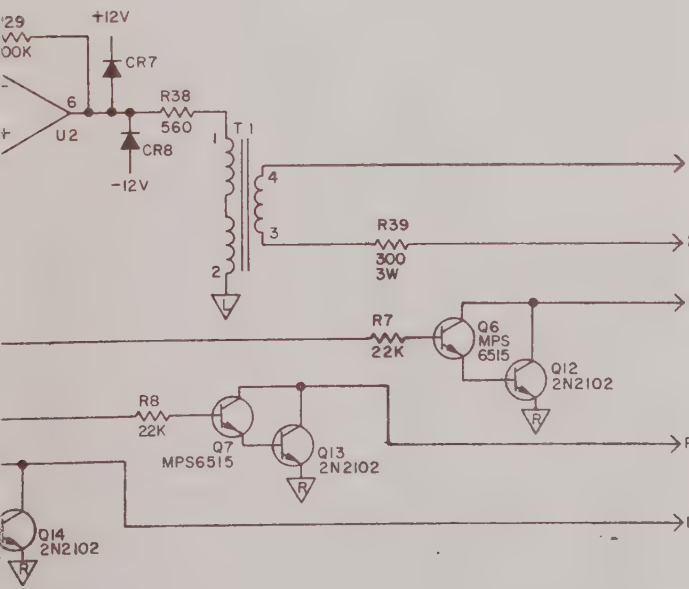
12 S_A BFRD

D GATE

20 BLEEP GATE (NOT USED)

X BLEEP

IC DATA					
REF DES	TYPE	+5V	−12V	+12V	GND
U1, U3	CD4001	14	—	—	7
U2	LM741	—	4	7	—



1 TRACE T

2 TRACE R

N $\overline{A \cdot C}$

P $\overline{A \cdot B}$

R $\overline{A \cdot A}$

S $\overline{B \cdot C}$

T $\overline{B \cdot B}$

U $\overline{B \cdot A}$

LAST-USED REFERENCE DESIGNATIONS							
C9	R39	CR8	T1	K2	U3	Q17	

NOTES
1. CAPACITANCE IN MICROFARADS
2. ALL DIODES IN4148 UNLESS OTHERWISE SPECIFIED

OCT 22 1979

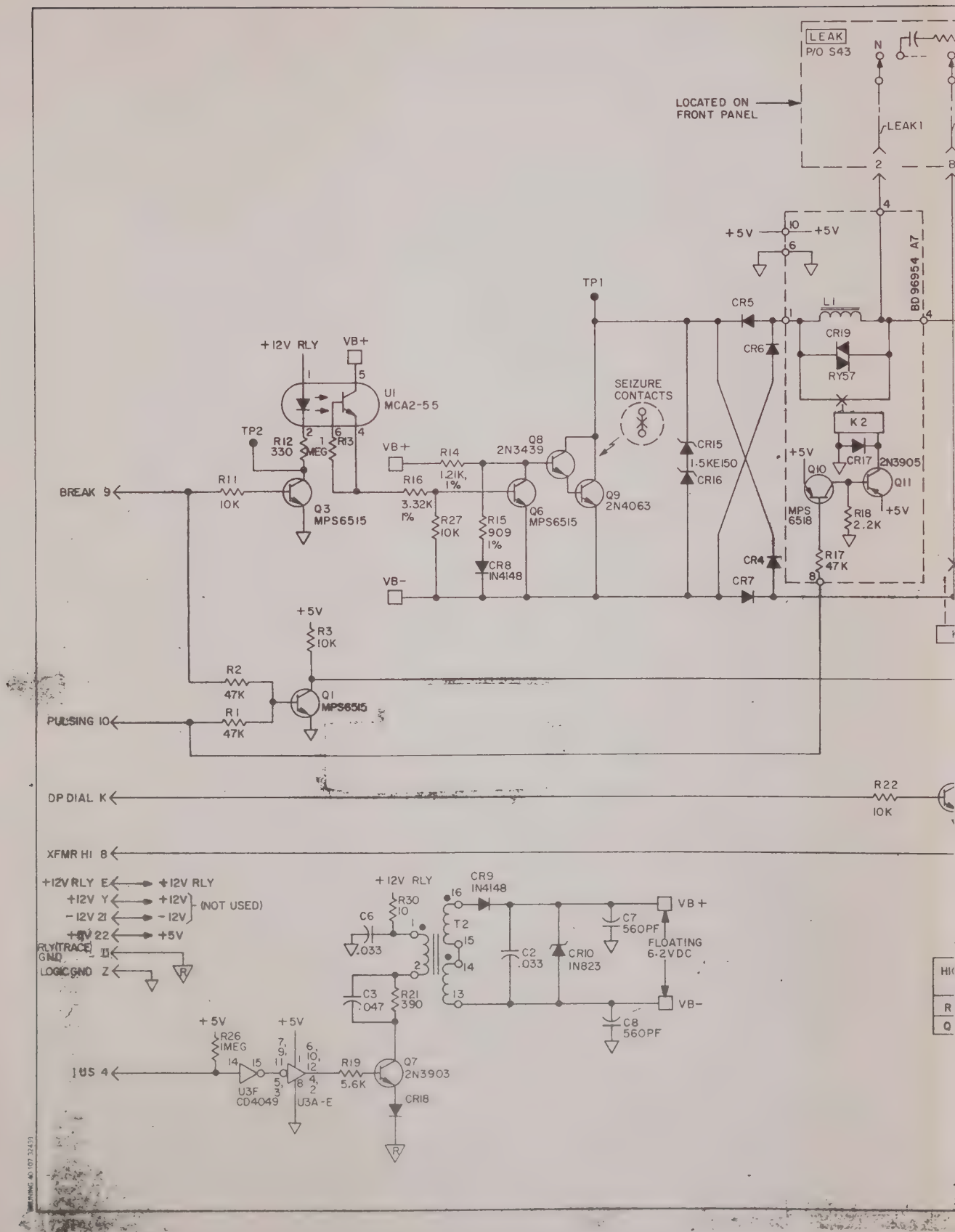
LINE SWITCHING INTERFACE
96815

REPAIR

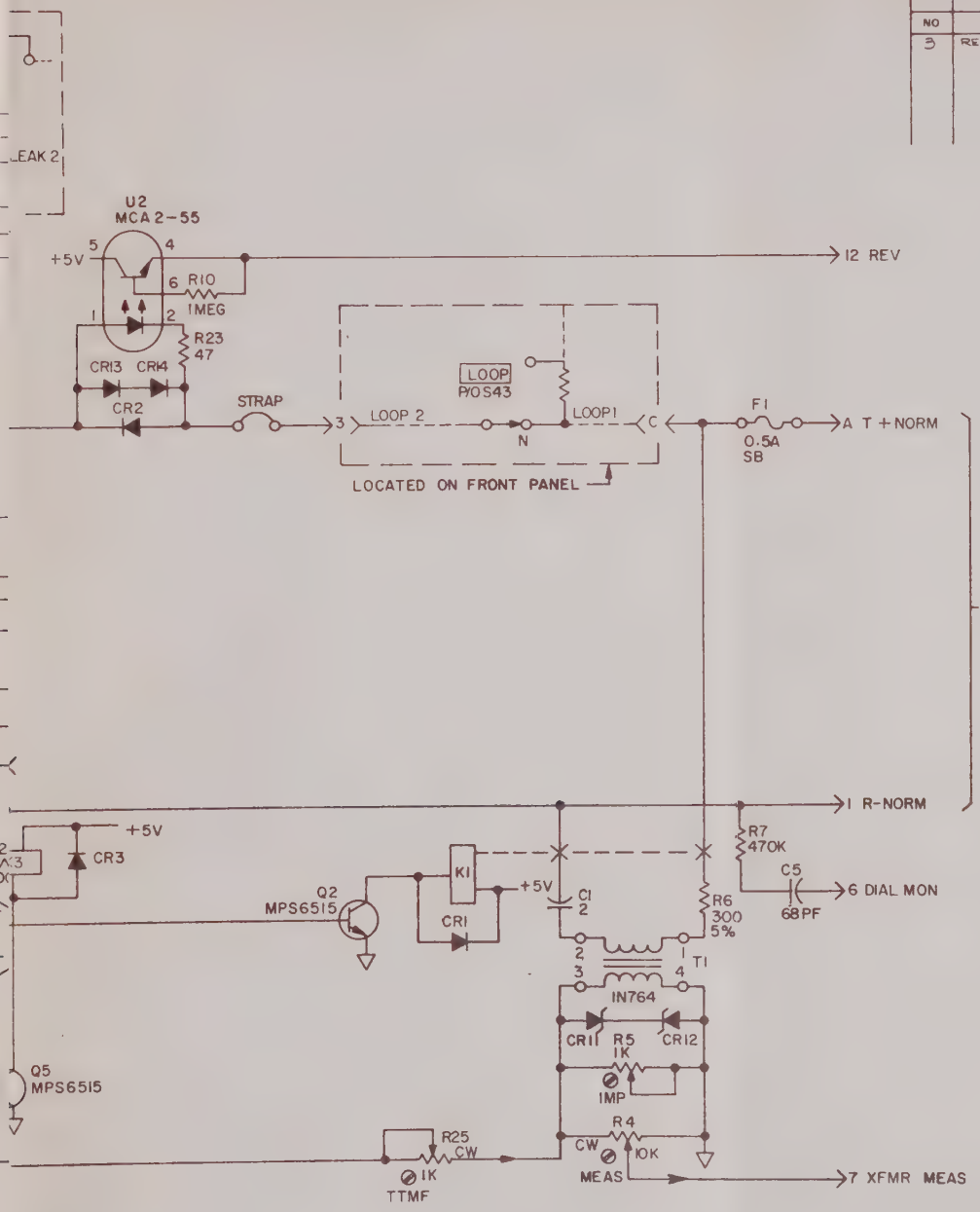
NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN ANTAL	DATE 6/2/78
CHECKED	
APPROVED	

SIZE D | NUMBER D0041-13


LEAK
P/O S43
LOCATED ON FRONT PANEL
LEAK1
+5V
BD 96954 A7
TP1
CR5
L1
CR19
CR6
RY57
+12V RLY
VB+
U1 MCA2-55
SEIZURE CONTACTS
K 2
TP2
R12 330
R13 1 MEG
VB+
R14
Q8 2N3439
CR15 1.5KE150
CR16
CR17
2N3905
Q10
Q11
MPS 6518
R18 2.2K
+5V
BREAK 9
R11 10K
R16 3.32K 1%
R27 10K
R15 909 1%
Q3 MPS6515
Q6 MPS6515
Q9 2N4063
CR8 IN4148
VB-
CR4
CR7
R17 47K
R3 10K
R2 47K
R1 47K
Q1 MPS6515
PULSING 10
DP DIAL K
R22 10K
XFMR HI 8
+12V RLY E
+12V RLY
+12V Y
+12V
- 12V 21
- 12V
(NOT USED)
+5V 22
+5V
RLY TRACE GND
LOGIC GND Z
+12V RLY
R30 10
C6 .033
T2
CR9 IN4148
C2 .033
CR10 IN823
C7 560PF
VB+
FLOATING 6.2VDC
C3 .047
R21 390
VB-
C8 560PF
+5V
R26 1MEG
U3F CD4049
U3A-E
R19 5.6K
Q7 2N3903
CR18
BUS 4

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
3	REDRAWN E/O 42 (932)	3-2	



CHEST REFERENCE DESIGNATIONS		
30	C8	U3
11	CR17	

NOTES
1. UNLESS OTHERWISE SPECIFIED:
RESISTORS ARE IN OHMS,
CAPACITORS ARE IN UF,
DIODES ARE IN4006.

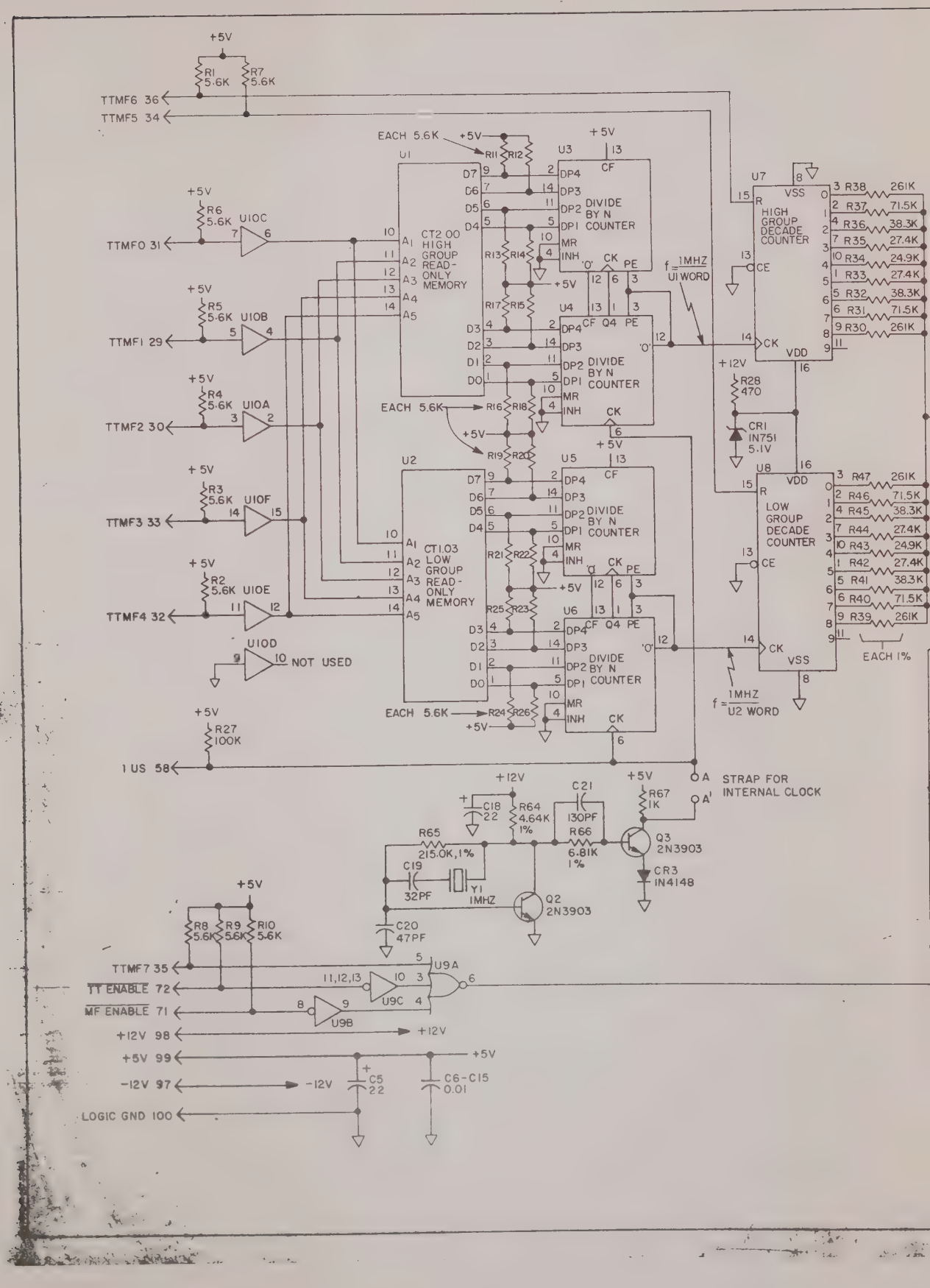
OCT 22 1979

REPAIR

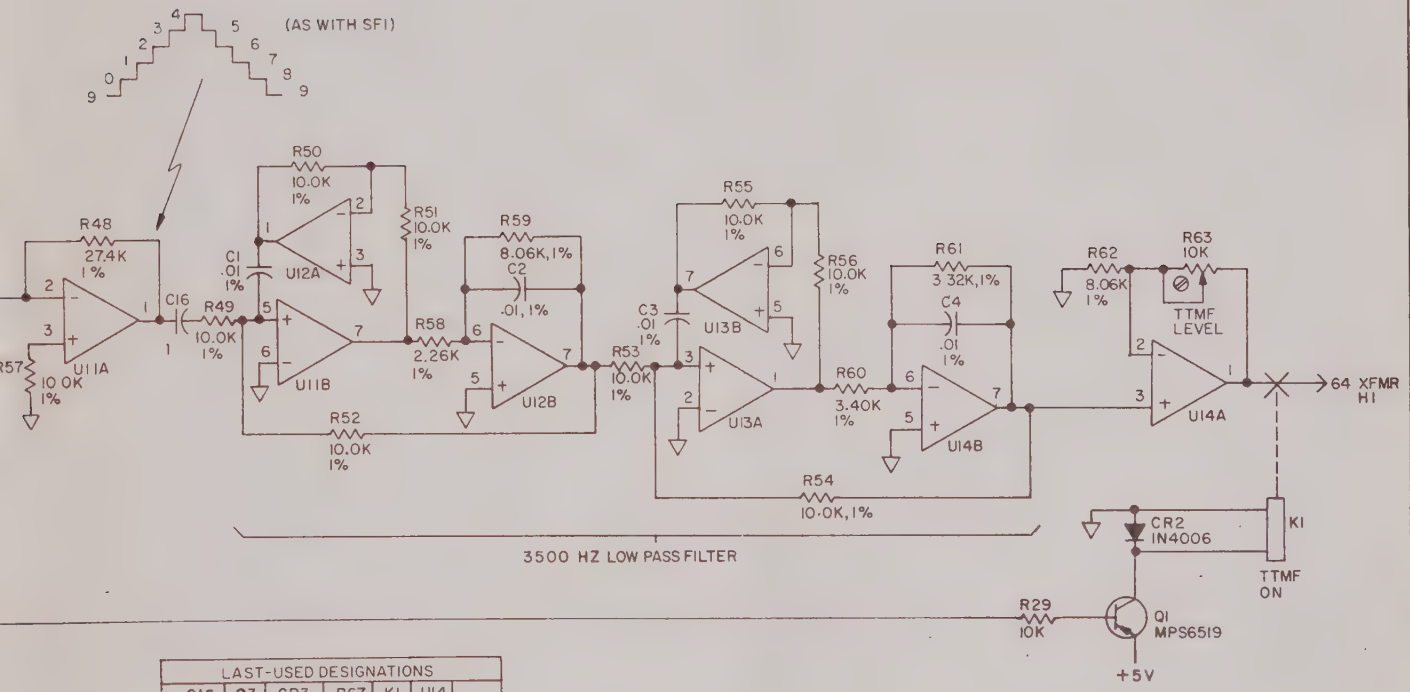
DIALING/HOLD CIRCUIT
SCHEMATIC DIAGRAM 96814

NORTHEAST ELECTRONICS ITT
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN	DATE	SCALE
CHECKED		DATE
APPROVED		DATE
SIZE D	NUMBER 004-13-818	


+5V
R1 5.6K
R7 5.6K
TTMF6 36
TTMF5 34
EACH 5.6K
U1
U3
U7
U8
U2
U5
U4
U6
CT2.00 HIGH GROUP READ-ONLY MEMORY
CT1.03 LOW GROUP READ-ONLY MEMORY
DIVIDE BY N COUNTER
HIGH GROUP DECADE COUNTER
LOW GROUP DECADE COUNTER
f = 1MHZ / U1 WORD
f = 1MHZ / U2 WORD
+12V
R28 470
CR1 IN751 5.1V
R6 5.6K U10C
R5 5.6K U10B
R4 5.6K U10A
R3 5.6K U10F
R2 5.6K U10E
U10D
NOT USED
TTMF0 31
TTMF1 29
TTMF2 30
TTMF3 33
TTMF4 32
R27 100K
1 US 58
EACH 1%
STRAP FOR INTERNAL CLOCK
C18 22
R64 4.64K 1%
C21 130PF
R67 1K
R65 215.0K, 1%
R66 6.81K 1%
Q3 2N3903
CR3 IN4148
C19 32PF
Y1 1MHZ
Q2 2N3903
C20 47PF
R8 5.6K
R9 5.6K
R10 5.6K
TTMF7 35
TT ENABLE 72
MF ENABLE 71
U9A
U9B
U9C
+12V 98
+5V 99
-12V 97
LOGIC GND 100
C5 22
C6-C15 0.01

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
1	PER ECN 10 AL (932) 11/17	2-2-79	



LAST-USED DESIGNATIONS						
C16	Q3	CR3	R67	K1	U14	

NOTES

1. IC DATA

REF DES	TYPE	VDD (+5V)	VSS (GND)	+V (+12V)	-V (-12V)
U1, U2	SN74S188	16	8	-	-
U3-U6	MC14526	16	8	-	-
U7-U8	CD4017	16	8	-	-
Q3	MC14000	14	7	-	-
U10	CD4050	1	8	-	-
U11-U14	LM1458N	-	-	8	4

2. CAPACITANCE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED.
3. INTERNAL CLOCK INSTALLED ON BOARD ONLY IN EQUIPMENT REQUIRING THIS CLOCK

ADDRESS TTMF 0-4 (DECIMAL)	LOW GROUP PROM U2 WORD (HEXADECIMAL)	HIGH GROUP PROM U1 WORD (HEXADECIMAL)	DIVIDER OUT (≈CODE X 10) LOW (HZ)	DIVIDER OUT (≈CODE X 10) HIGH (HZ)	CODE
0	00	00	0	0	-
1	8F	53	6990	12050	TT1
2	8F	4B	6990	13330	TT2
3	8F	44	6990	14710	TT3
4	82	53	7690	12050	TT4
5	82	4B	7690	13330	TT5
6	82	44	7690	14710	TT6
7	75	53	8550	12050	TT7
8	75	4B	8550	13330	TT8
9	75	44	8550	14710	TT9
10	6A	4B	9430	13330	TT0
11	6A	53	9430	12050	TT*
12	6A	44	9430	14710	TT#
13	00	00	0	0	-
14	00	2A	0	23810	SF1
15	00	26	0	26320	SF2

ADDRESS TTMF 0-4 (DECIMAL)	LOW GROUP PROM U2 WORD (HEXADECIMAL)	HIGH GROUP PROM U1 WORD (HEXADECIMAL)	DIVIDER OUT (≈CODE X 10) LOW (HZ)	DIVIDER OUT (≈CODE X 10) HIGH (HZ)	CODE
16	00	6F	0	9010	-
17	8F	6F	6990	9010	MF1
18	8F	5B	6990	10990	MF2
19	6F	5B	9010	10990	MF3
20	8F	4D	6990	12990	MF4
21	6F	4D	9010	12990	MF5
22	5B	4D	10990	12990	MF6
23	8F	43	6990	14930	MF7
24	6F	43	9010	14930	MF8
25	5B	43	10990	14930	MF9
26	4D	43	12990	14930	MF0
27	5B	3B	10990	16950	KP(KP1)
28	43	3B	14930	16950	ST
29	8F	3B	6990	16950	ST3P(CD11)
30	6F	3B	9010	16950	STP (CD12)
31	4D	3B	12990	16950	ST2P(KP2)

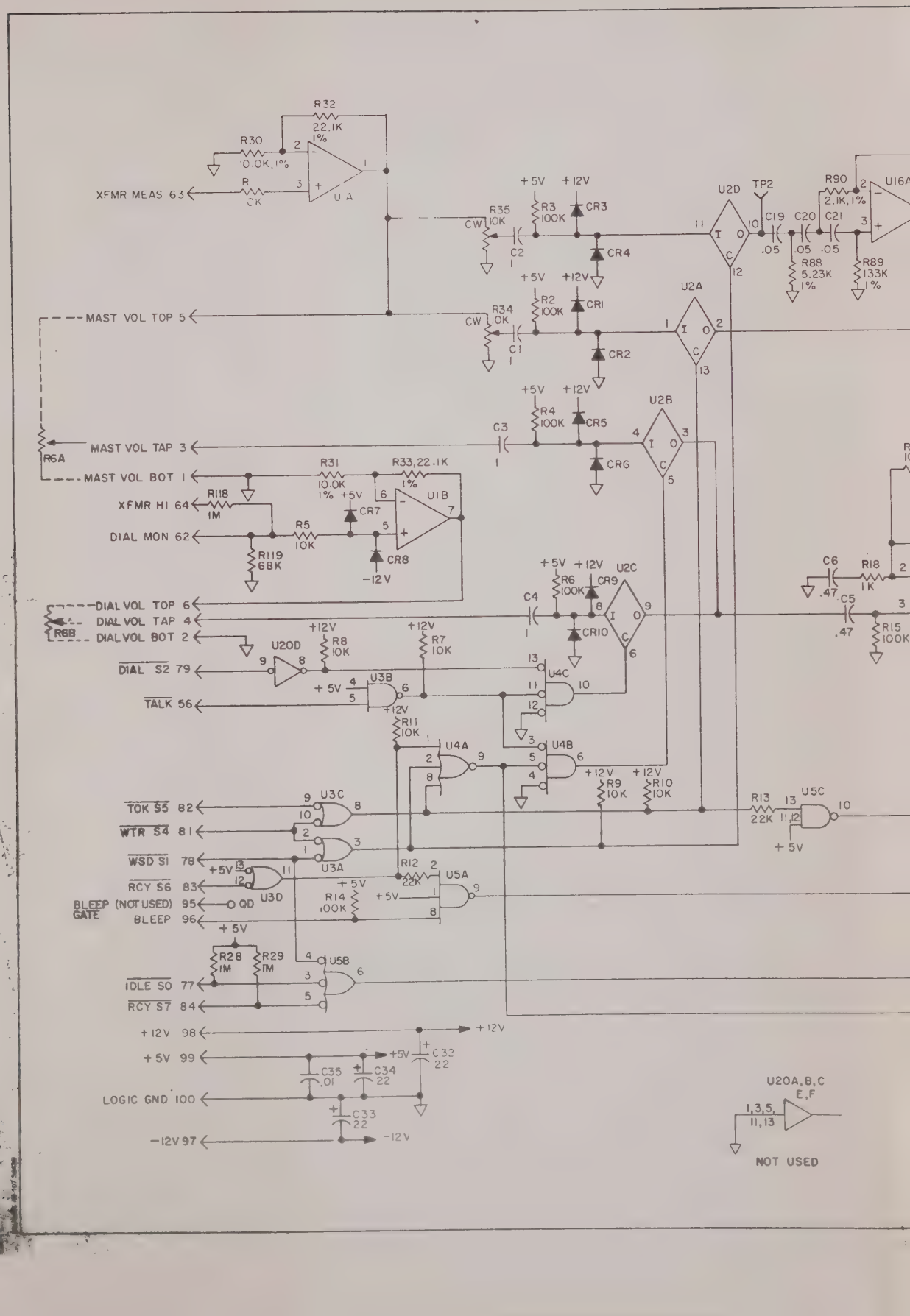
REPAIR

DIGITAL TT/MF GENERATOR
96825

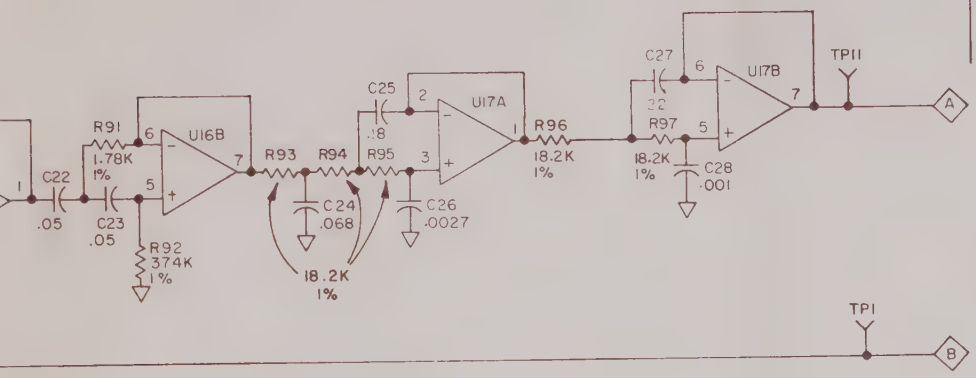
OCT 22 1979

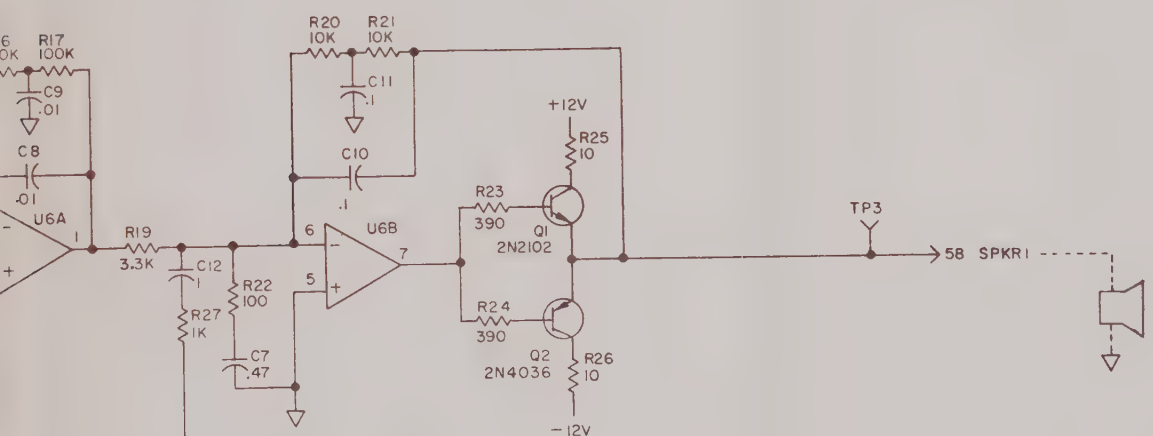
NORTHEAST ELECTRONICS INC.
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN ANTAL	DATE 6/28/78	SCALE	
CHECKED		DATE	
APPROVED		DATE	
SIZE D	NUMBER D 0041-B-320		

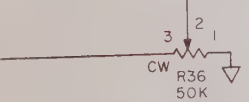

R32
22.1K
1%
R30
10.0K,1%
XFMR MEAS 63
R
2K
U 1A
R35
10K
CW
C2
.1
+5V
+12V
R3
100K
CR3
CR4
U2D
TP2
C19
.05
C20
.05
C21
.05
R88
5.23K
1%
R90
2.1K,1%
U16A
R89
133K
1%
MAST VOL TOP 5
R34
10K
CW
C1
.1
R2
100K
CR1
CR2
U2A
MAST VOL TAP 3
R6A
MAST VOL BOT 1
C3
.1
R4
100K
CR5
CR6
U2B
R31
10.0K
1%
R33,22.1K
1%
XFMR HI 64
R118
1M
DIAL MON 62
R5
10K
R119
68K
U1B
CR7
CR8
-12V
DIAL VOL TOP 6
DIAL VOL TAP 4
DIAL VOL BOT 2
R6B
C4
.1
R6
100K
CR9
CR10
U2C
C6
.47
R18
1K
C5
.47
R15
100K
U20D
R8
10K
R7
10K
DIAL S2 79
TALK 56
U3B
U4C
R11
10K
U4A
U4B
R9
10K
R10
10K
TOK S5 82
WTR S4 81
WSD S1 78
RCY S6 83
BLEEP (NOT USED) 95
BLEEP GATE
BLEEP 96
U3C
U3A
U3D
QD
R12
22K
R14
100K
U5A
R13
22K
U5C
R28
1M
R29
1M
U5B
IDLE S0 77
RCY S7 84
+12V 98
+5V 99
LOGIC GND 100
-12V 97
C35
.01
C34
22
C32
22
C33
22
U20A,B,C
E,F
1,3,5,
11,13
NOT USED

NO	REVISIONS DESCRIPTION	DATE	APPROVAL
4	REDRAWN % 42 (932) 11	3-6-79	





60 TC ENBL (NOT USED)



61 SLV HLD DSBL

C

OCT 22 1979

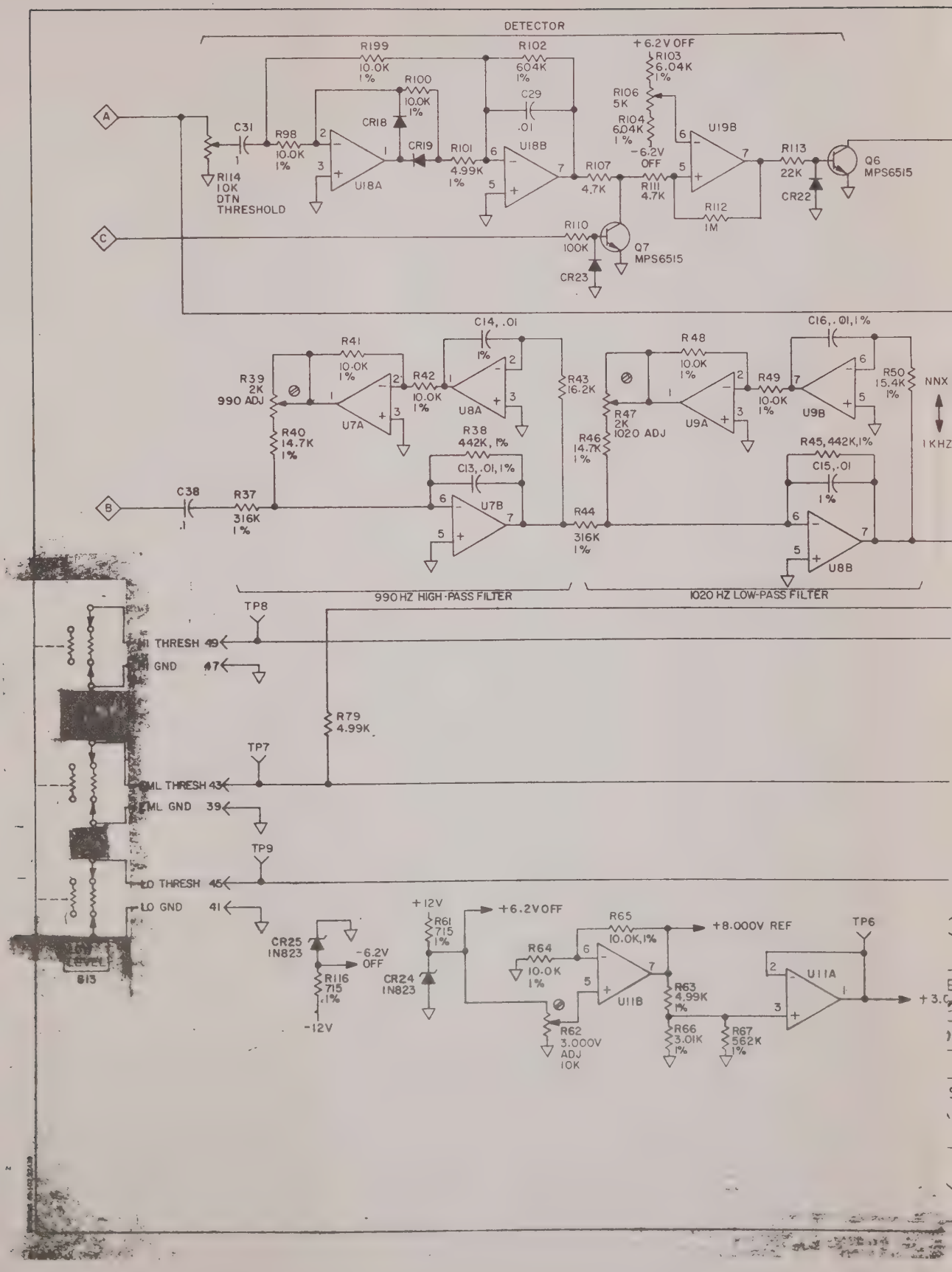
REPAIR

MONITOR TONES
DETECTOR
96830

NORTHEAST ELECTRONICS Intl
CONCORD, NEW HAMPSHIRE, U.S.A. 03301

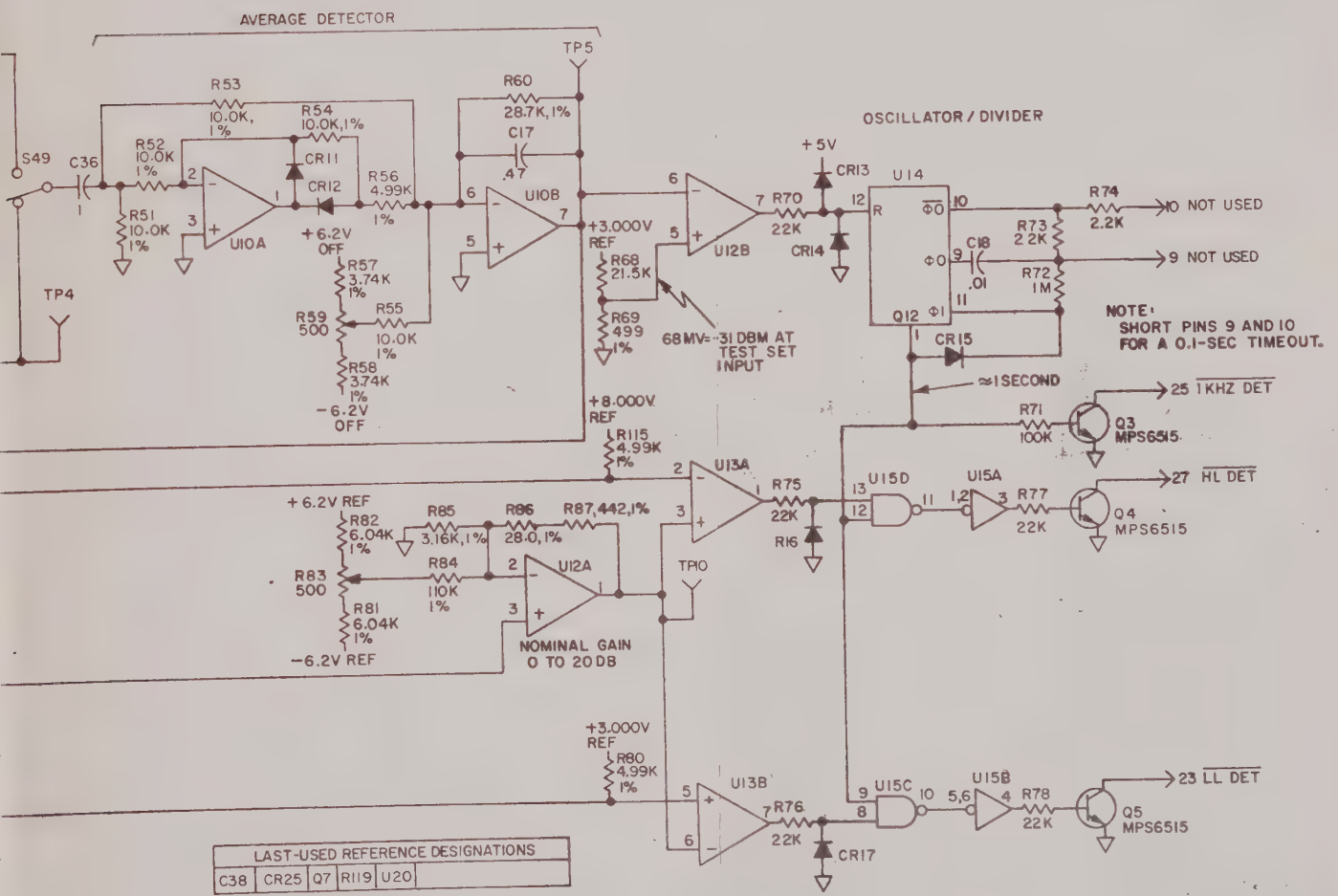
DRAWN ANTAL	DATE 6/29/78	SCALE	
CHECKED		DATE	
APPROVED		DATE 7-2-79	
SIZE D	NUMBER D0041-13-321		4

SHT 1 OF 2


DETECTOR
R199
10.0K
1%
R102
604K
1%
+6.2V OFF
R103
6.04K
1%
R100
10.0K
1%
C29
.01
R106
5K
R104
6.04K
1%
-6.2V
OFF
U19B
C31
R98
10.0K
1%
CR18
CR19
R101
4.99K
1%
U18B
R107
4.7K
R111
4.7K
R113
22K
Q6
MPS6515
CR22
R114
10K
DTN
THRESHOLD
U18A
R112
1M
R110
100K
Q7
MPS6515
CR23
A
C
B
C14, .01
1%
C16, .01, 1%
R41
10.0K
1%
R48
10.0K
1%
R39
2K
990 ADJ
R42
10.0K
1%
R43
16.2K
R49
10.0K
1%
R50
15.4K
1%
NNX
1 KHZ
U7A
U8A
U9A
U9B
R40
14.7K
1%
R38
442K, 1%
R47
2K
1020 ADJ
R46
14.7K
1%
R45, 442K, 1%
C13, .01, 1%
C15, .01
1%
C38
.1
R37
316K
1%
U7B
R44
316K
1%
U8B
990 HZ HIGH-PASS FILTER
1020 HZ LOW-PASS FILTER
TP8
HI THRESH 49
HI GND 47
R79
4.99K
TP7
TML THRESH 43
TML GND 39
TP9
LO THRESH 45
LO GND 41
LO LEVEL
615
+12V
R61
715
1%
+6.2VOFF
R65
10.0K, 1%
+8.000V REF
TP6
CR25
1N823
-6.2V
OFF
R64
10.0K
1%
U11B
U11A
R63
4.99K
1%
CR24
1N823
R116
715
1%
-12V
R62
3.000V
ADJ
10K
R66
3.01K
1%
R67
562K
1%

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
A	REDRAWN S/O 42 (932)	11/13-279	RJK

21 MARK



LAST-USED REFERENCE DESIGNATIONS				
C38	CR25	Q7	R119	U20

000V REF

NOTES:
1. CAPACITANCE IN MICROFARADS.
2. ALL DIODES IN4148 UNLESS OTHERWISE SPECIFIED
3. IC DATA

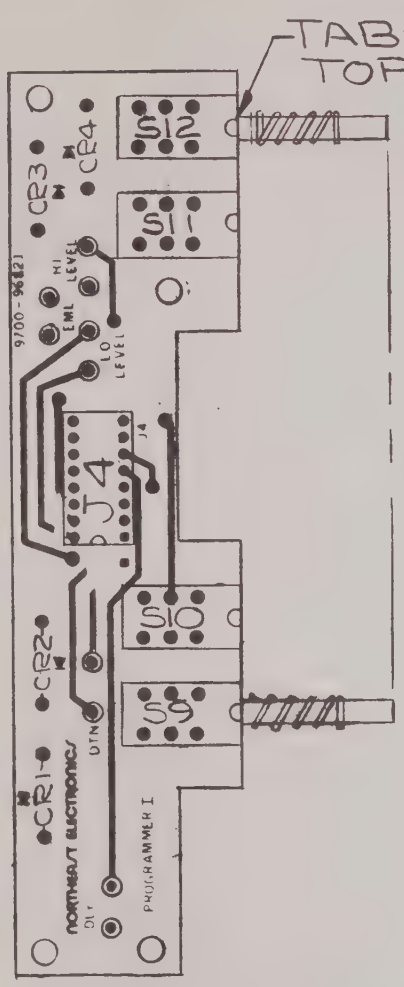
REF DES	TYPE	+V	-12V	GND
U1	LM1458N	8(+12V)	4	-
U2	CD4066	14(+12V)	-	7
U3	74LS26	14(+5V)	-	7
U4	CD4025	14(+12V)	-	7
U5	CD4023	14(+5V)	-	7
U6-U13	LM1458N	8(+12V)	4	-
U14	CD4060	16(+5V)	-	8
U15	CD4011	14(+5V)	-	7
U16-U19	LM1458N	8(+12V)	4	-
U20	SN7407N	14(+5V)	-	7

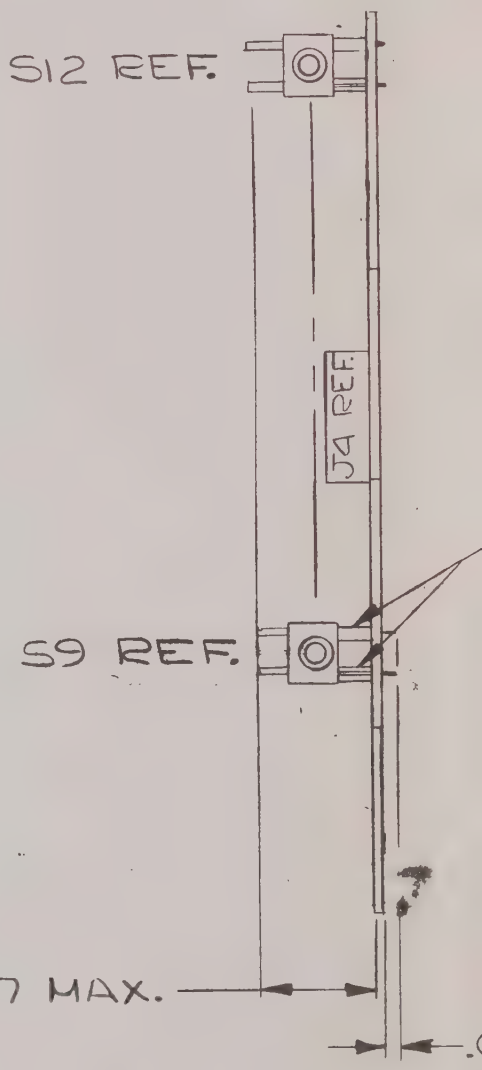
REPAIR

MONITOR TONES DETECTOR
96830 (SHEET 2 OF 2)
OCT 22,1979

NORTHEAST ELECTRONICS INT
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN ANTAL	DATE 6/28/78	SCALE	
CHECKED		DATE	
APPROVED		DATE	
SIZE D	NUMBER D0041-13-321		4





UNLESS OTHERWISE SPECIFI DIMENSIONS ARE IN INCH
ALL TOLERANCES ARE ± .0
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOW MAT'L .09 OR LESS, 1/64 RA MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS

NO	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	CHNGD PC BD C/O 6 (379)	12/10/77	
2	CHG. DOGBONE TO 1/8" C/O 23 (537)	5.9.78	

-DOGBONE 2 PLACES
PER SWITCH.
8 PLACES

REPAIR

OCT 22 1979

1.◎ DENOTES LARGE MALE
QUICK DISCONNECT. (10 PLACES)

09 MAX.

NOTES

TITLE
PROGRAMMER I
BD. ASS'Y 96821

~~FINISH — ETCH AND IRIDITE~~
~~PAINT — FEDERAL SPEC. 595~~
~~COLOR 26492~~
~~R AND S VINYL 8050. W24~~

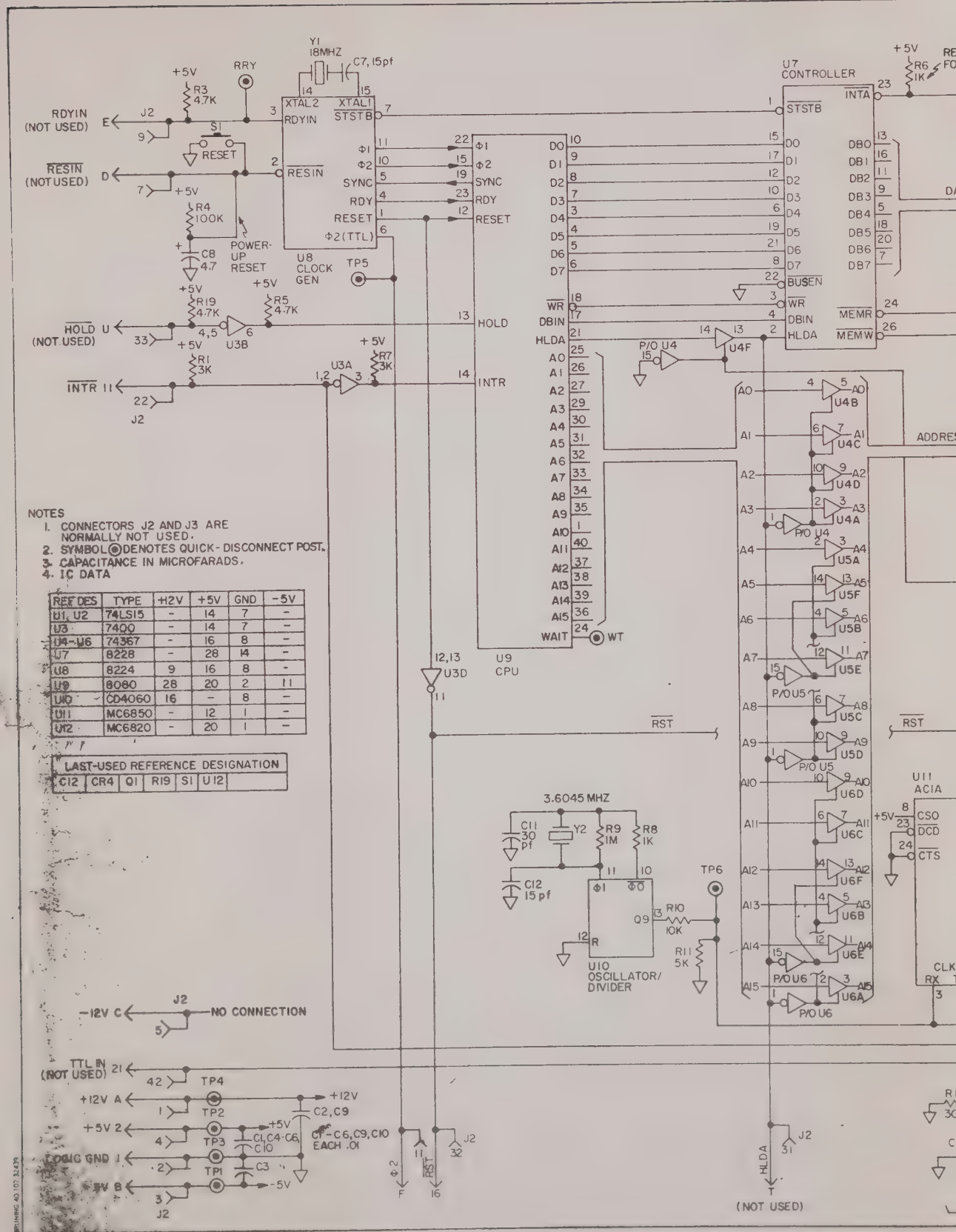
~~MATERIAL~~
~~ALUMINUM~~
~~6062-T4~~
~~3003-T14~~

~~SCREEN PER~~ schematic 2241-13-313

NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN MCF	DATE 3/7/77	SCALE 1/1
CHECKED DD	DATE 7-13-77	
APPROVED SKN	DATE 7-21-77	

SIZE	NUMBER	ISSUE
B	0041-13-012	2


Y1
18MHZ
C7, 15pf
+5V
R3
4.7K
RDYIN
(NOT USED)
J2
E
9
S1
RESET
RESIN
(NOT USED)
D
7
R4
100K
C8
4.7
POWER-
UP
RESET
U8
CLOCK
GEN
TP5
XTAL2
XTAL1
RDYIN
STSTB
RESIN
Φ1
Φ2
SYNC
RDY
RESET
Φ2(TTL)
U7
CONTROLLER
STSTB
INTA
DO
D1
D2
D3
D4
D5
D6
D7
BUSEN
WR
DBIN
HLDA
DB0
DB1
DB2
DB3
DB4
DB5
DB6
DB7
MEMR
MEMW
R6
1K
R19
4.7K
R5
4.7K
HOLD
(NOT USED)
U
33
4,5
6
U3B
HOLD
R1
3K
INTR
11
22
J2
U3A
1,2
3
R7
3K
INTR
WAIT
WT
U9
CPU
P/O U4
U4F
14
13
2
A0
A1
A2
A3
A4
A5
A6
A7
A8
A9
A10
A11
A12
A13
A14
A15
U4B
U4C
U4D
U4A
U5A
U5F
U5B
U5E
U5C
U5D
U6D
U6C
U6F
U6B
U6E
U6A
P/O U5
P/O U6
ADDRES
RST
12,13
U3D
11
3.6045 MHZ
C11
30
pf
Y2
R9
1M
R8
1K
C12
15 pf
U10
OSCILLATOR/
DIVIDER
Φ1
Φ0
Q9
R
R10
10K
R11
5K
TP6
U11
ACIA
CSO
DCD
CTS
CLK
RX
NOTES
1. CONNECTORS J2 AND J3 ARE NORMALLY NOT USED.
2. SYMBOL ⊙ DENOTES QUICK-DISCONNECT POST.
3. CAPACITANCE IN MICROFARADS.
4. IC DATA
REF DES | TYPE | +12V | +5V | GND | -5V
U1, U2 | 74LS15 | - | 14 | 7 | -
U3 | 7400 | - | 14 | 7 | -
U4-U6 | 74367 | - | 16 | 8 | -
U7 | 8228 | - | 28 | 14 | -
U8 | 8224 | 9 | 16 | 8 | -
U9 | 8080 | 28 | 20 | 2 | 11
U10 | CD4060 | 16 | - | 8 | -
U11 | MC6850 | - | 12 | 1 | -
U12 | MC6820 | - | 20 | 1 | -
LAST-USED REFERENCE DESIGNATION
C12 | CR4 | Q1 | R19 | S1 | U12
-12V C
J2
5
NO CONNECTION
TTL IN
(NOT USED)
21
42
TP4
+12V A
1
TP2
+12V
C2, C9
+5V 2
4
TP3
+5V
C1, C4-C6,
C10
C1-C6, C9, C10
EACH .01
LOGIC GND 1
2
TP1
C3
-5V B
3
J2
Φ2
F
11
RST
16
J2
32
HLDA
T
J2
31
(NOT USED)

REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
0	I.E.N REL. Y0.42 (532)	9-27-79	KJL

STARTS CPU AT 0038 (RST 7)
R ALL INTERRUPTS

TA BUS

S BUS

J2
12 INTA (NOT USED)
24
10 DB0
40
15 DB1
30
X DB2
39
19 DB3
38
18 DB4
36
14 DB5
28
13 DB6
26
W DB7
37
17 MEMR
34
V MEMW
35

U3C
9 10
8

P A0
25
R A1
27
S A2
29
H A3
13
L A4
19
K A5
17
M A6
21
J A7
15
3 A8
6
4 A9
8
8 A10
16
7 A11
14
9 A12
18
6 A13
12
10 A14
20
5 A15
10

U2A A8 A15 13 1,2
U2C A9 A12 A14 A10 A11 A13 11 10 9 5 4 3
U2B
12 8 6
U4E 12 11
R2 4.7K
+5V

U1A A3 A5 A7 A8 A9 A6 A4 I/O 1 2 13 9 10 11 3 4, 5
U1C
U1B
12 8 6
DB0 DB1 DB2 DB3 DB4 DB5 DB6 DB7 EN A0 A1 A2 CS
FFF8
R18 4.7K
+5V
FF

N I/O
J2
23

13
R/W
21 34 23
R/W RESET CS2
U12

PIA
(NORMALLY NOT INSTALLED IN 41-3A)

R/W			
D0	22	DB0	33 D0
D1	21	DB1	32 D1
D2	20	DB2	31 D2
D3	19	DB3	30 D3
D4	18	DB4	29 D4
D5	17	DB5	28 D5
D6	16	DB6	27 D6
D7	15	DB7	26 D7
CS1	10	CS	22 CS0
RS	11	A0	35 RS1
		A1	36 RS0
CS2	9	A2	24 CS1
E	14	EN	25 E
IRQ	7		37 IRQB
			38 IRQA

PA0 PA1 PA2 PA3 PA4 PA5 PA6 PA7 PB0 PB1 PB2 PB3 PB4 PB5 PB6 PB7 CB1 CB2 CA2 CA1
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 39 40
Y TTL OUT (NOT USED)
41
J2

DATA
RX TX
4 2 6
R16, 1K
+5V
INTR

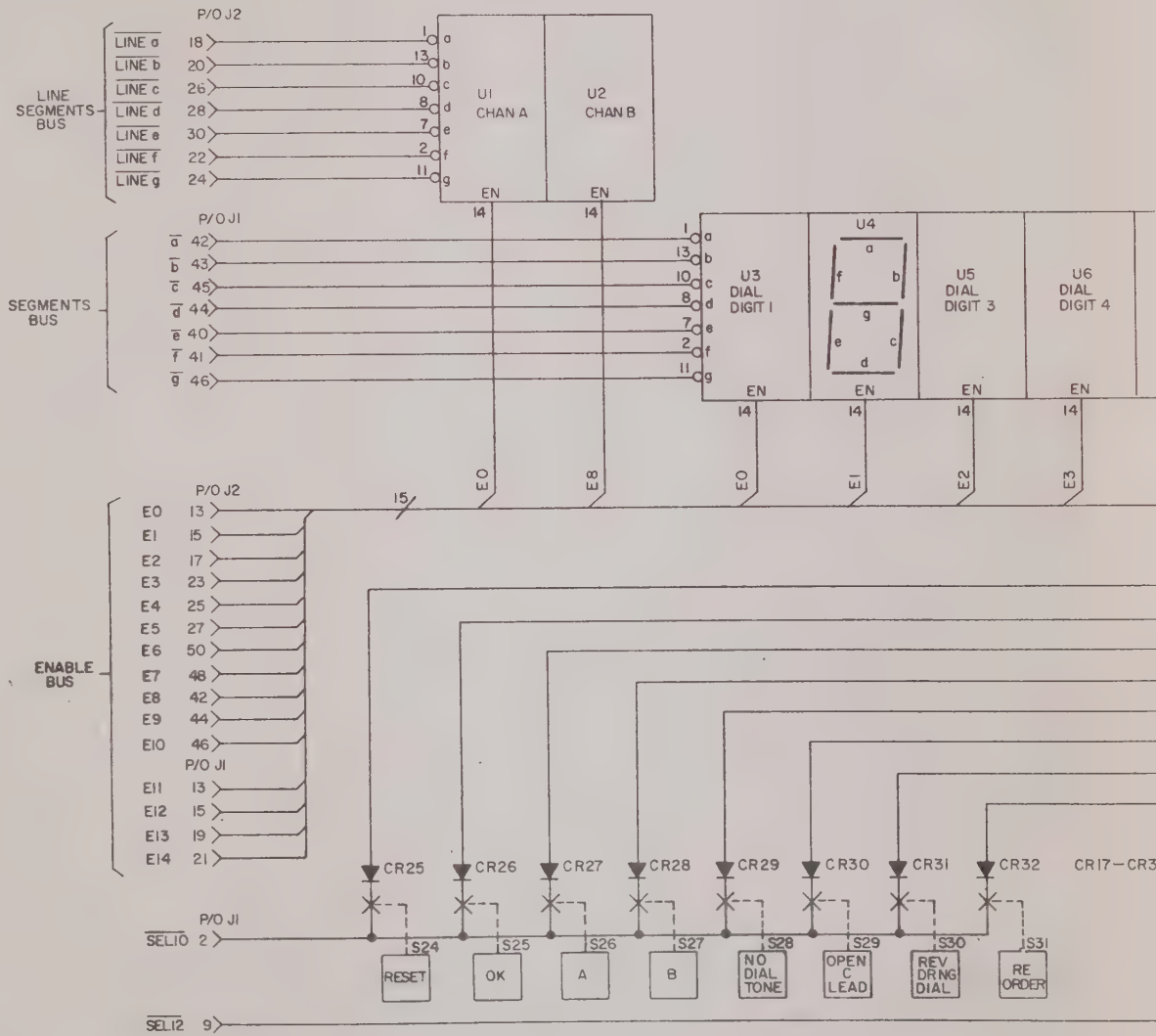
R14 5K
R13 3K
2N3903 Q1
+12V
CR3 CR2 1N4005'S
R12 400
R17 400
CR4, IN4005'S
+12V
+5V -5V +12V
24 (BD LOOP
21 PNTR LOOP
26 23 22 25

3 4 5 10 7 16 9 18 11 20 13 14 15 12 17 8 19 6 2 1
J3 (NORMALLY NOT USED)

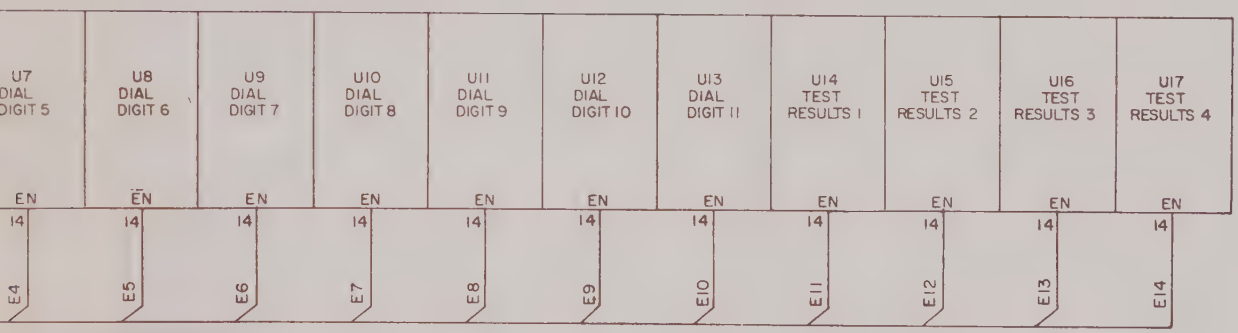
REPAIR
OCT 22 1979
PROCESSOR

NORTHEAST ELECTRONICS itt
CONCORD, NEW HAMPSHIRE, U.S.A. 03301

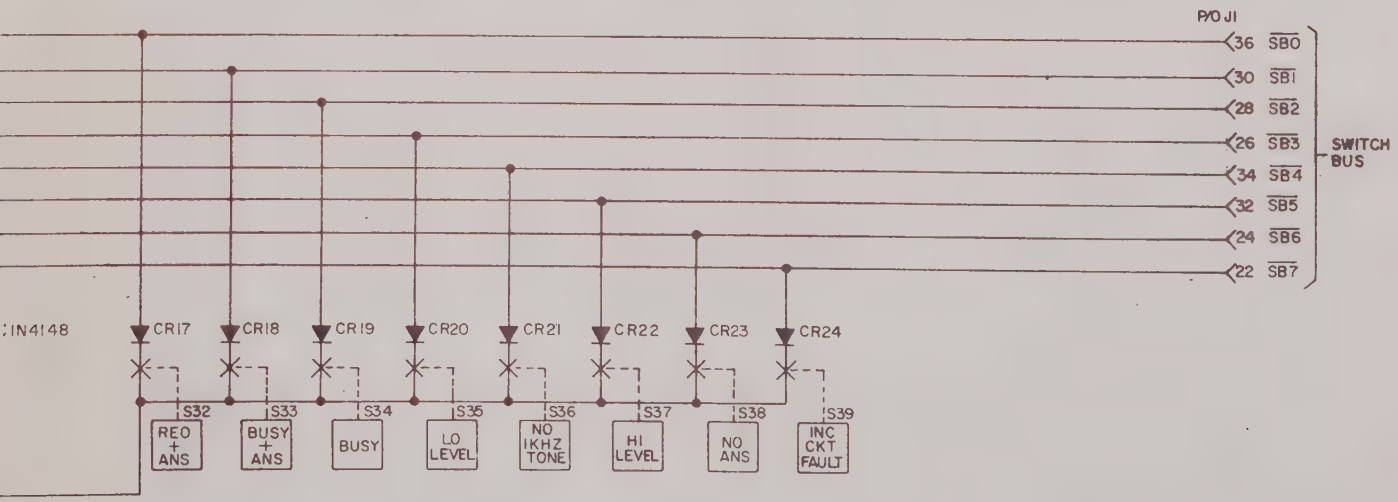
DRAWN	DATE	SCALE
CHECKED		DATE
APPROVED RJK		DATE 9-2-79
SIZE D	NUMBER 0041-13-308	REV 0


P/O J2
LINE SEGMENTS BUS
LINE a 18
LINE b 20
LINE c 26
LINE d 28
LINE e 30
LINE f 22
LINE g 24
U1 CHAN A
U2 CHAN B
EN
14
P/O J1
SEGMENTS BUS
a 42
b 43
c 45
d 44
e 40
f 41
g 46
U3 DIAL DIGIT 1
U4
U5 DIAL DIGIT 3
U6 DIAL DIGIT 4
E0
E8
E1
E2
E3
P/O J2
ENABLE BUS
E0 13
E1 15
E2 17
E3 23
E4 25
E5 27
E6 50
E7 48
E8 42
E9 44
E10 46
P/O J1
E11 13
E12 15
E13 19
E14 21
15
CR25
CR26
CR27
CR28
CR29
CR30
CR31
CR32
CR17–CR3
P/O J1
SEL10 2
SEL12 9
S24
S25
S26
S27
S28
S29
S30
S31
RESET
OK
A
B
NO DIAL TONE
OPEN C LEAD
REV DRNG DIAL
RE ORDER

NO	REVISIONS DESCRIPTION	DATE	APPROVAL
	REDRAWN % 42 (932)	3-27-79	



U1–17 ARE HP 5082-7650



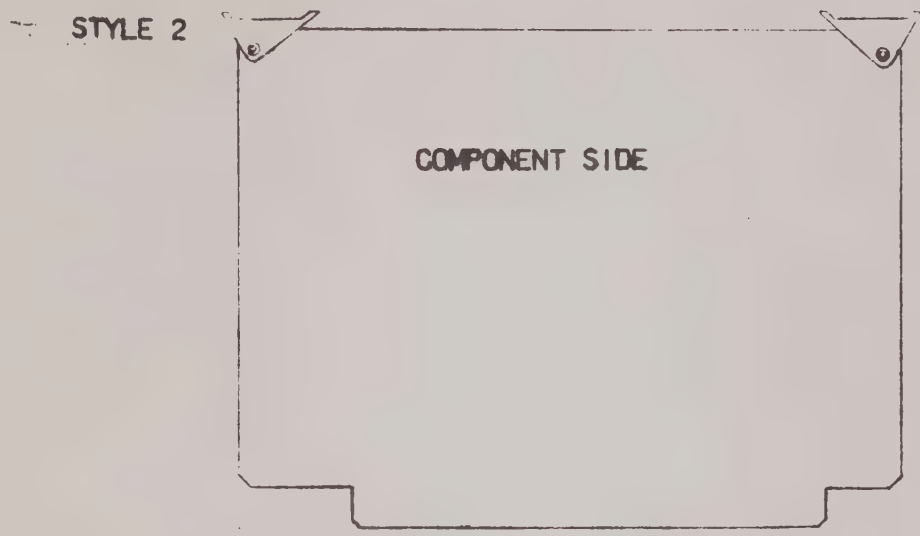
REPAIR

OCT 22 1979

DISPLAY BOARD
96813 (SHEET 1 OF 2)

NORTHEAST ELECTRONICS ntt
CONCORD, NEW HAMPSHIRE, U.S.A. 03301

DRAWN ANTAL	DATE 7-29-78	SCALE	
CHECKED		DATE	
APPROVED		DATE 9-2-79	
SIZE D	NUMBER 0041-13-310		



EJECTOR LIST

EJECTOR	STYLE 2	STYLE 1	P.C.BD.	ASSEMBLY
1	865909000	865900200	96815	B 0041-13-018
2	865909100	865900300	96814	B 0048-13-019
4	865909300	865900500	96825	C 0041-13-020
5	865909400	865900600	96830	C 0041-13-021
6	865909500	865900700	96824	C 0041-13-022
7	865909600	865900800	96818	C 0041-13-023
8	865909700	865900900	96819	C 0041-13-024
9	865909800	———	96703	B 0001-01-078
10	865909900	865901100	96702	B 0041-13-031

UNLESS OTHERWISE SPECIFIE
DIMENSIONS ARE IN INCHE
ALL TOLERANCES ARE ± .0
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS
MAT'L .09 OR LESS, 1/64 RA
MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES
DEBUR ALL HOLES
SAND ALL SURFACES
WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	[illegible]

OCT 22 1979

REPAIR

NOTES

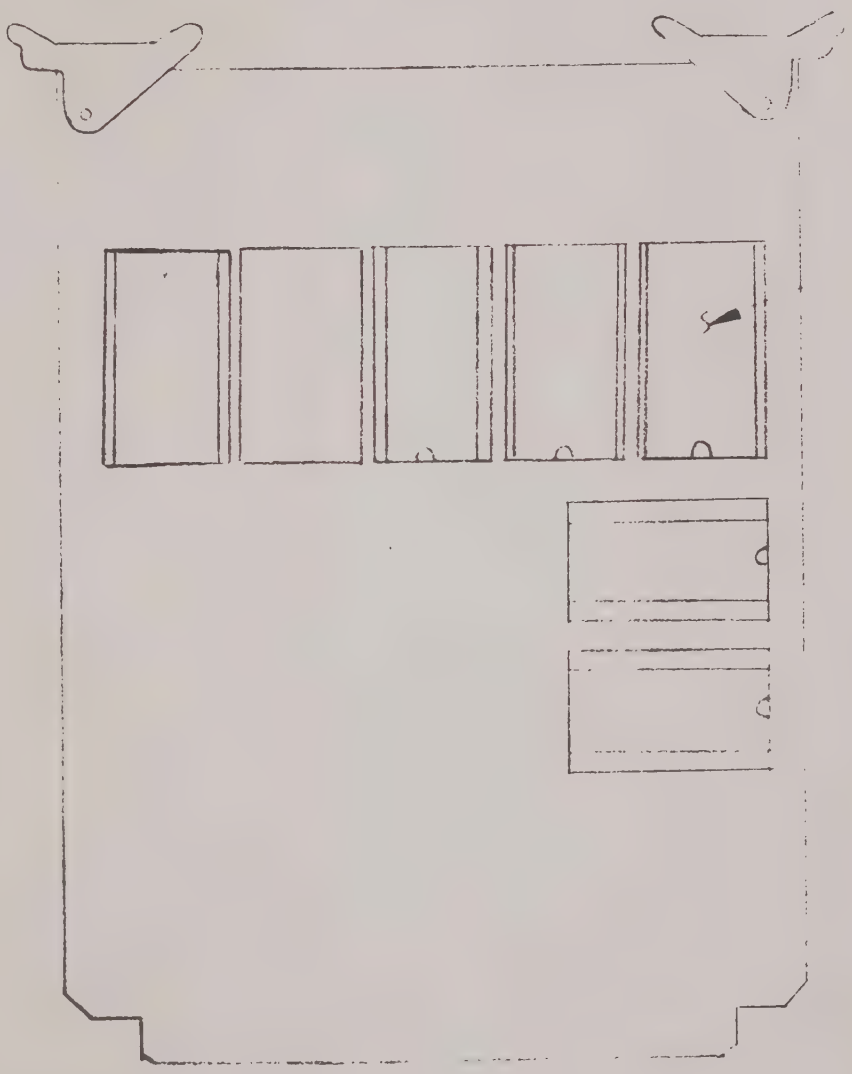
TITLE

EJECTOR TAB ASSEMBLY

NORTHEAST ELECTRONICS nt

CONCORD, NEW HAMPSHIRE

~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF	DATE 6/7/77 SCALE 1/1
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H134~~	CHECKED DJD	DATE 7-13-77
~~R AND S VINYL 8050, W24~~	~~3003 H14~~	APPROVED SKN	DATE 7-21-77
~~SCREEN PER~~		SIZE B	NUMBER 0041-13-042 ISSUE O



— SEE NOTE

UNLESS OTHERWISE SPECIFIE DIMENSIONS ARE IN INCHE
ALL TOLERANCES ARE ± .0
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RA MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	-	3.29.78	

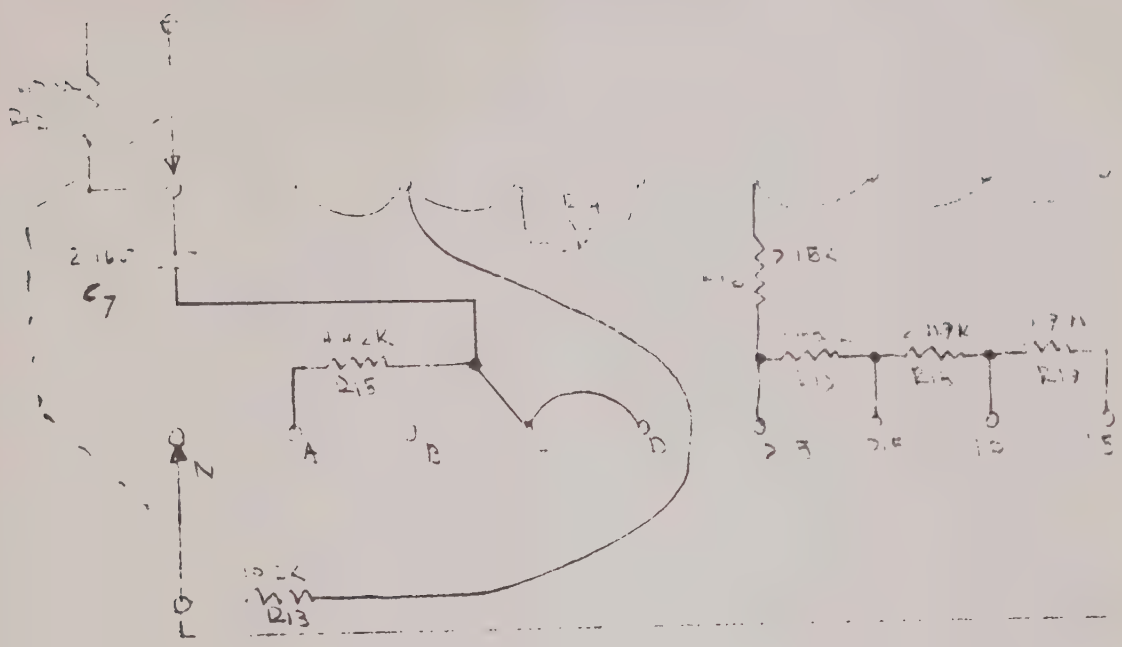
OCT 22 1979

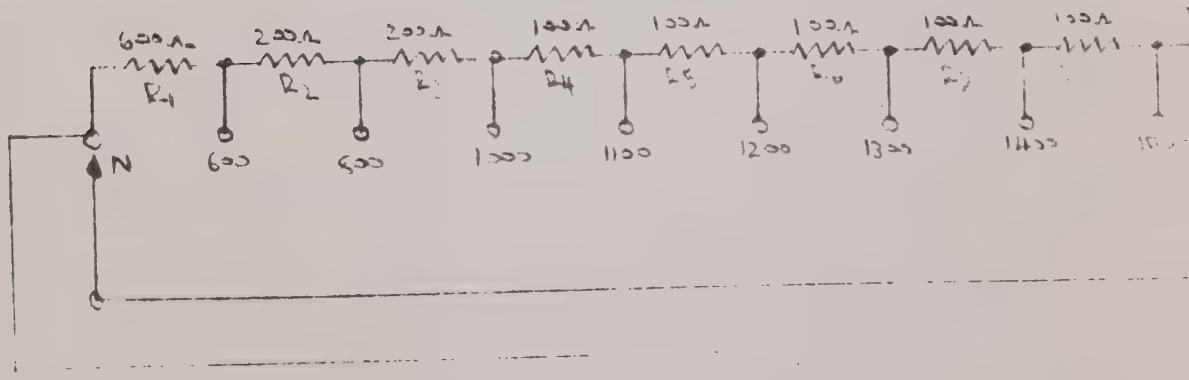
REPAIR

1. INSTALL U14 PROM THIS POSITION CARD 10.

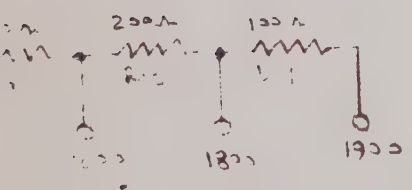
NOTE

TITLE: 41-3A MF INSTALLATION		NORTHEAST ELECTRONICS CORPORATION CONCORD, N.H., U.S.A.	
~~FINISH — ETCH AND IRIDITE~~	MATERIAL	DRAWN	DATE 10/22/79 SCALE —
~~PAINT — FEDERAL SPEC. 595~~ COLOR 26492	~~ALUMINUM~~ ~~5052-H34~~ 3003 ~~H14~~	CHECKED SKN	DATE 11-22-79
R AND S VINYL 8050, W24		APPROVED SKN	DATE 11-22-79
~~SCREEN PER~~		SIZE B	NUMBER 0041-13-068 ISSUE 0


A
B
D
N
R13


600Ω
200Ω
200Ω
100Ω
100Ω
100Ω
100Ω
100Ω
R1
R2
R3
R4
R5
R6
R7
N
600
1000
1100
1200
1300
1400

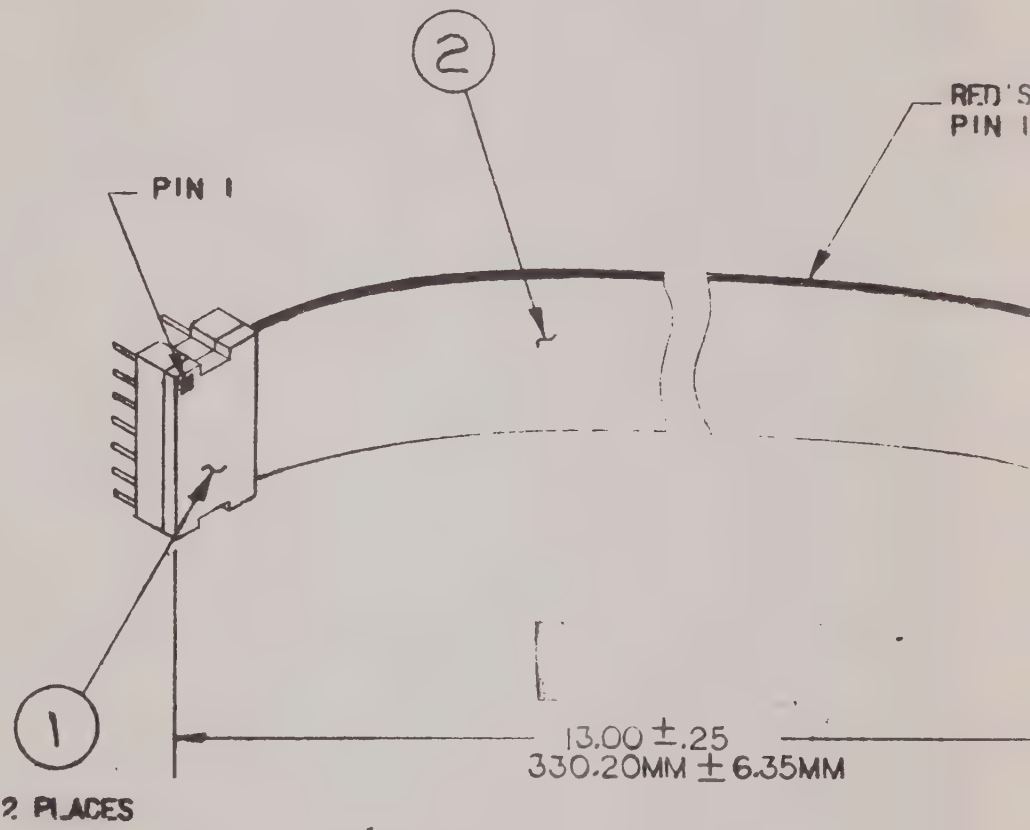
C	ORIGINAL ISSUE	9-22-7?	SKN
	CORRECTED AT CONN. [illegible]		



OCT 22 1979

REPAIR

REV

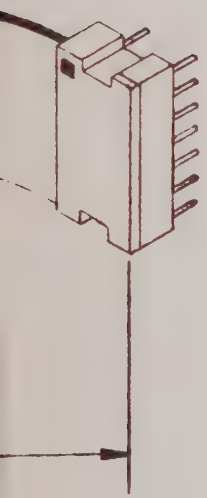


UNLESS OTHERWISE SPECI DIMENSIONS ARE IN INC
ALL TOLERANCES ARE ±
ALL BENDS ARE 90° ± 1
BEND RADIUS AS FOLLO MAT'L .09 OR LESS, 1/64 MATL .125, 3/32 RAD
BREAK ALL SHARP EDG DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 28093-1

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	ORG. DIM. FROM INSIDE TO OUTSIDE 5/16 (322) .XXX	7/12/77	

TRIP DENOTES



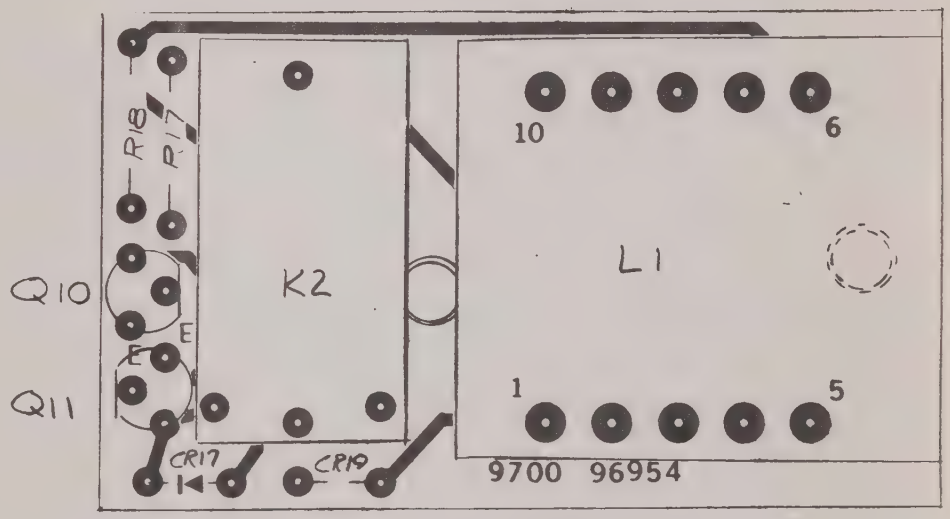
REPAIR

OCT 22 1979

P 1. ALL DIMENSIONS IN MM ARE ± .38MM UNLESS OTHERWISE SPECIFIED.

NOTES

TITLE: FLAT CABLE (16 MED.)			NORTHEAST ELECTRONICS Int		
	~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF	DATE 5/31/77	SCALE —
	~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052-H34 3003-H14~~	CHECKED D.R.		DATE 7-15-77
	~~R AND S VINYL 8050, W24~~		APPROVED SKN		DATE 7-21-77
	~~SCREEN PER~~		SIZE B	NUMBER 0041-13-037	ISSUE 1

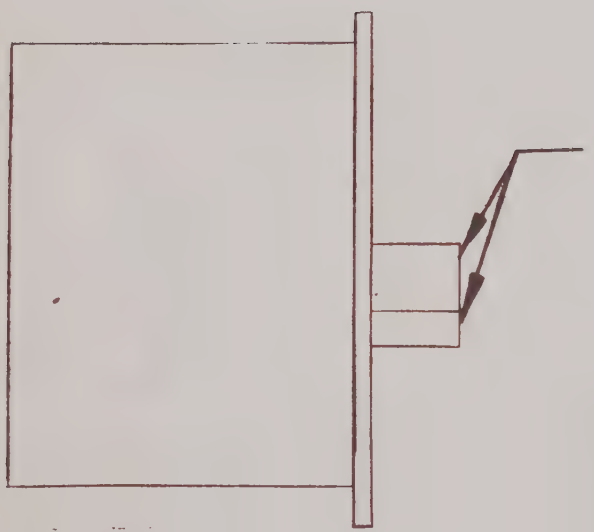


UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BINING 40 107 2809 x 2

REVISIONS

NO	DESCRIPTION	DATE	APPROVAL
0	NEW DRAWING PER C/033 (586)	8-25-78	P.J.L.



OCT 22 1979

REPAIR

NOTES

TITLE

L1 / CONTROL BD. ASSY.
96954

~~FINISH — ETCH AND IRIDITE~~
PAINT — FEDERAL SPEC. 595
COLOR 26492
R AND S VINYL 8060, W24

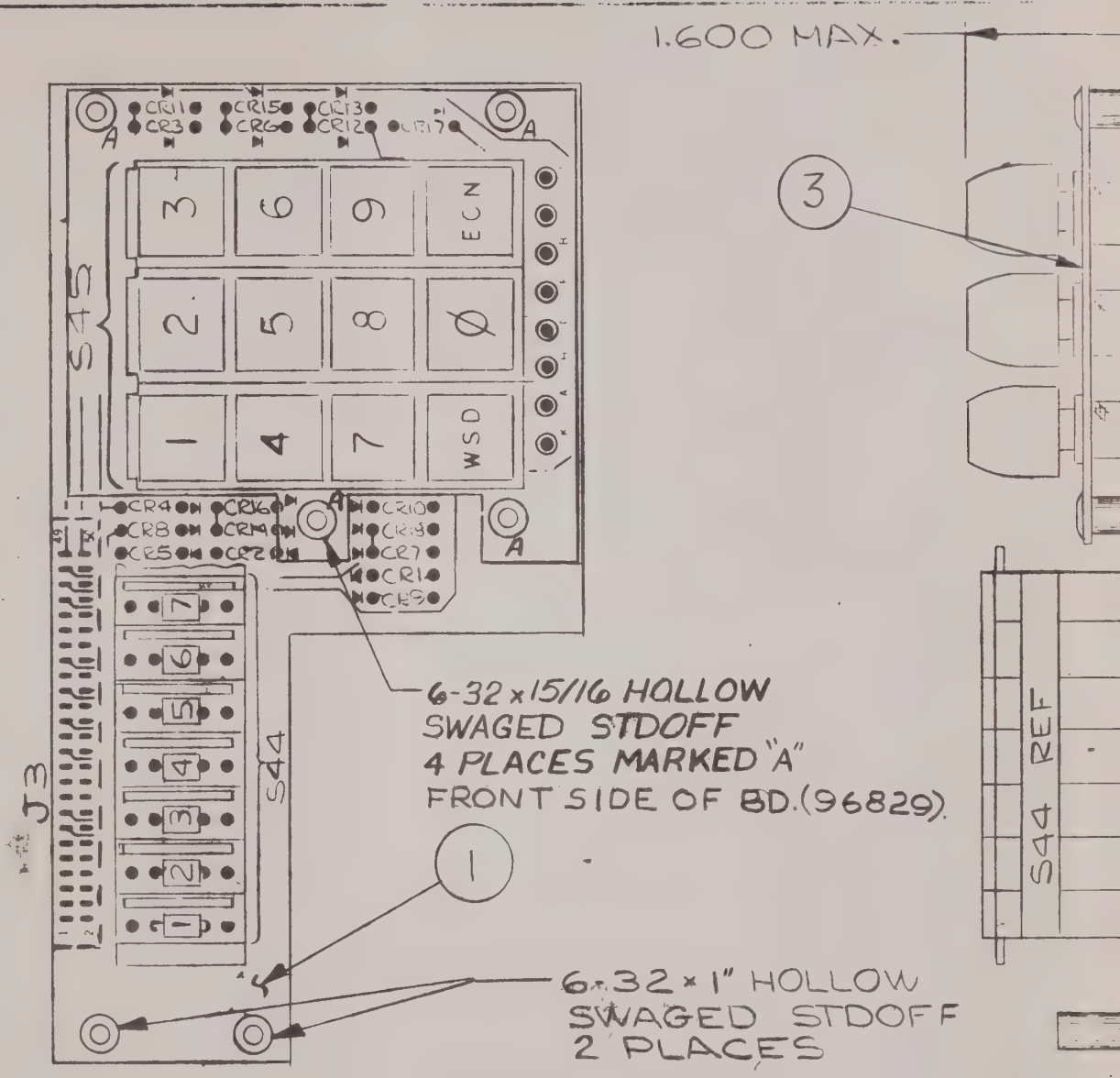
~~MATERIAL~~
ALUMINUM
5052 H34
3003 H14

~~SCREEN PER~~

NORTHEAST ELECTRONICS nt

DRAWN KP	DATE Dec 23, 78	SCALE —
CHECKED A. Montemayor		DATE 8-25-78
APPROVED R.K.		DATE 9-8-78

SIZE	NUMBER	ISSUE
B	0041-13-072	0



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .01
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

NO	DESCRIPTION		
0	ORIGINAL ISSUE	9-22-77	SKN
1	CHNGD STDOFF INFO %6 (336)	11-8-77	SKN
2	CHANGED STANDOFF %6 (430)	7-27-78	Mal
3	ADD SHT REWORK %5 (122) PPL	4-6-79	Mal

REPAIR

OCT 22 1979

◉ DENOTES LARGE MALE QUICK DISCONNECT.

NOTES

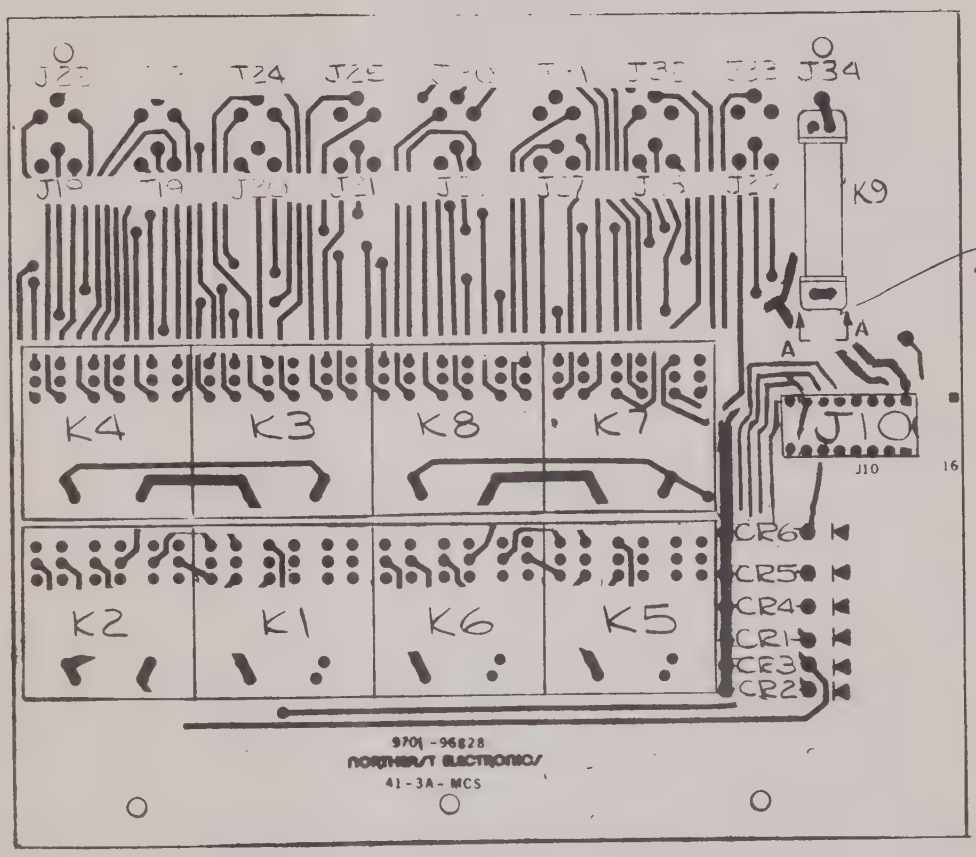
TITLE
KEYBOARD ASS'Y
96829

~~FINISH ETCH AND IRIDITE~~	~~MATERIAL~~
~~PAINT FEDERAL SPEC 595~~	~~ALUMINUM~~
~~COLOR 26492~~	~~5052 H34~~
~~R AND S VINYL 8060 W24~~	~~3003 H14~~
~~SCREEN PER~~ schematic 0041-13-317	

NORTHEAST ELECTRONICS
Division of nt northern telecom
CONCORD, NEW HAMPSHIRE, U.S.A.

DRAWN MCF	DATE 3/5/77	SCALE 1/1
CHECKED DD Cahill	DATE 7-13-77	
APPROVED SKN	DATE 7-21-77	

SIZE	NUMBER	ISSUE
B	0041-13-017	3



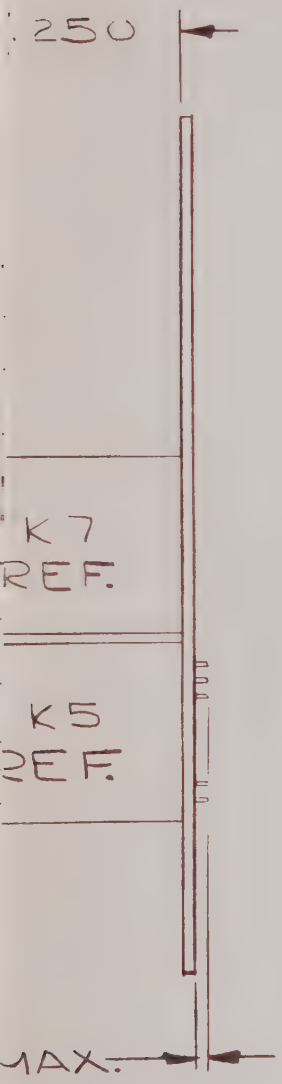
VIEW A-A

.09

PINS FROM RELAY COIL ARE INSERTED THRU HOLES NEAREST BD. EDGE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	ADD VIEW A-A C1025 (560)	5-9-78	R.L.



REPAIR

OCT 22 1979

NOTES

TITLE

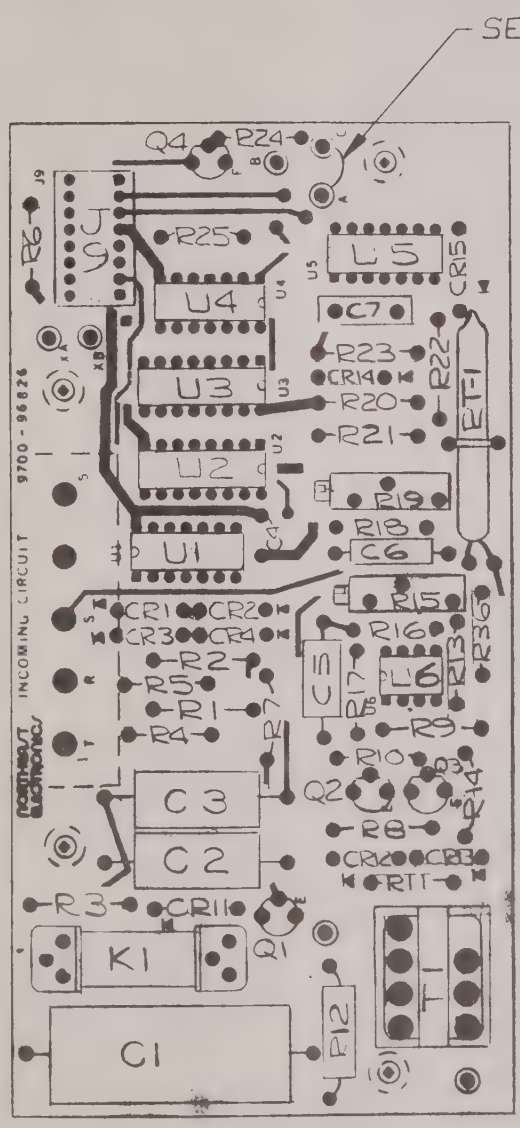
41-3A MCS BD
96828

~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34 3003 H14~~	
~~R AND S VINYL 8050, W24~~		
~~SCREEN PER~~ SCHEMATIC 0041-13-316		

NORTHEAST ELECTRONICS int
CONCORD, NEW HA[illegible]

DRAWN MCF	DATE 3/17/77	SCALE 1/1
CHECKED [illegible]	DATE 7-13-77	
APPROVED SKN	DATE 7-21-77	

SIZE	NUMBER	ISSUE
B	0041-13-016	1



SEE NOTE 4

4-40 x 5/16 STDOFF. 4 PLACES THREADED

.650 MAX.

UNLESS OTHERWISE SPECIFIE DIMENSIONS ARE IN INCHE
ALL TOLERANCES ARE ± .0
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RA MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS

NO	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	ADDED NOTE 4 c/o 3 (309)	10-31 77	SKN
2	PL CHNG ITEM 41 c/o 9 (363)	12-5-77	SKN

.800 MAX.

..EPAIR

4. A-C TO BE JUMPERED WITH 1 1/2" WIRE 22 GA STRANDED LG Q.D. AT BOTH ENDS.
3. C5 & C6 HAND SOLDERED AFTER WAVE SOLDERING.
2. RT1 TO BE WRAPPED WITH BUSS WIRE AND SOLDERED, ALSO RTV AT TIP.
1. ◉ DENOTES LARGE MALE QUICK DISCONNECT. (7 PLACES)

.09 MAX. TYP.

NOTES

OCT 22 1979

TITLE
INCOMING CIRCUIT BD.
ASS'Y 96826

NORTHEAST ELECTRONICS nt

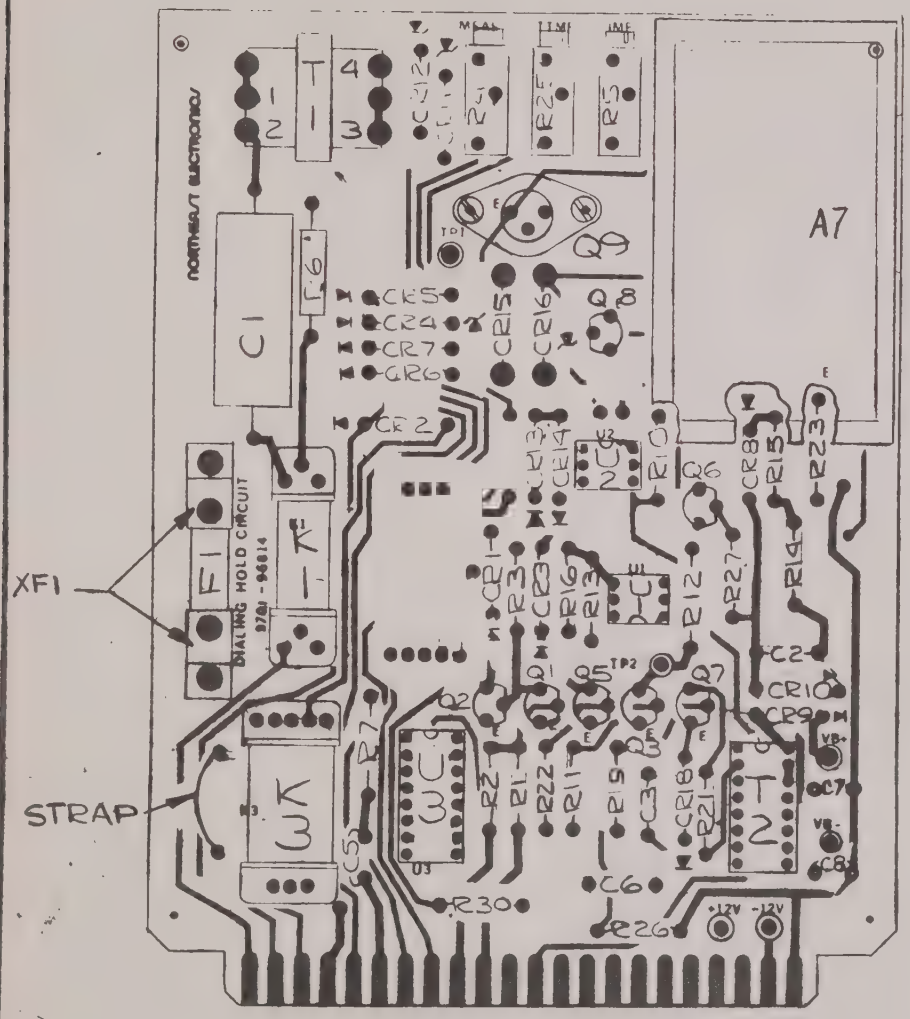
~~FINISH ETCH AND IRIDITE~~
~~PAINT FEDERAL SPEC. 595 COLOR 26492~~
~~R AND S VINYL 8050, W24~~

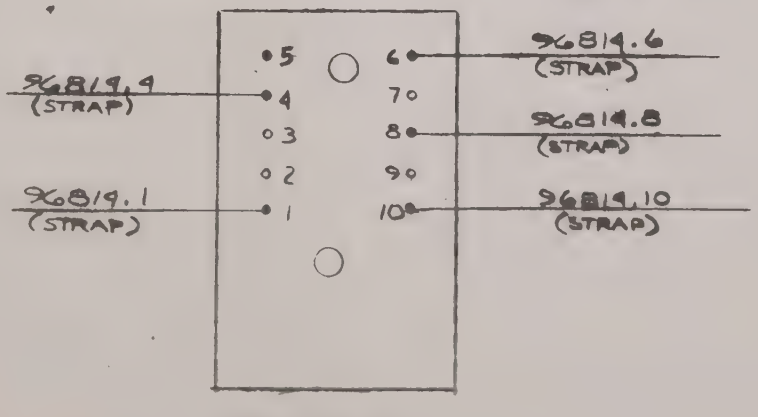
~~MATERIAL~~
~~ALUMINUM 5052 H34 3003 H14~~

~~SCREEN PER~~ Schematic 0041-13-315

DRAWN MCF DATE 3/2/77 SCALE 1/1
CHECKED DD DATE 7-13-77
APPROVED SKN DATE 7-21-77

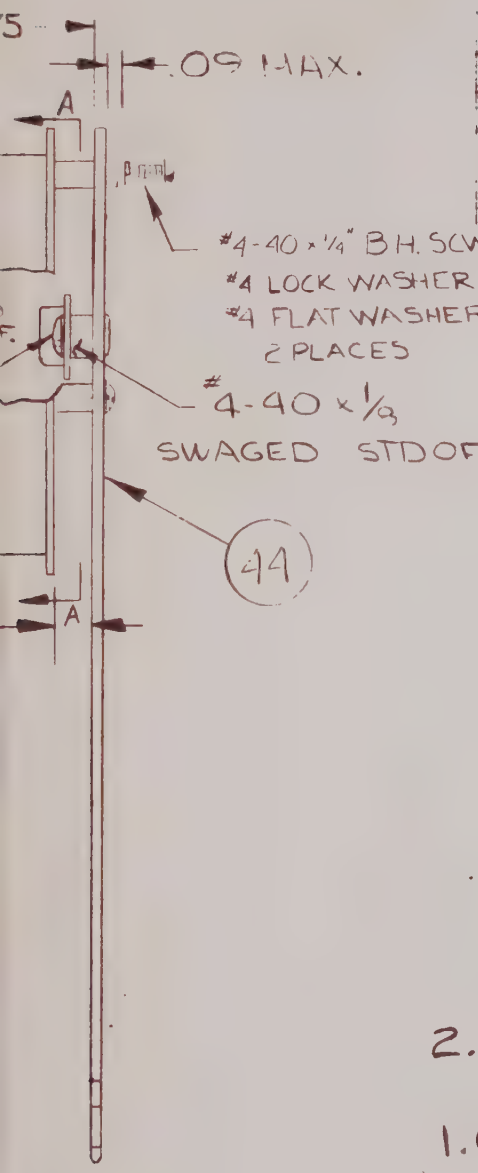
SIZE B | NUMBER 0041-13-015 | ISSUE 2





VIEW A-A
A1 BOTTOM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .01
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT



NO	DESCRIPTION		APP'D
0	ORIGINAL ISSUE	9-22-77	SKN
1	MOVED C4 PER ECO 3 (309)	10-[illegible]-77	SKN
2.	CHANGED C5 VALUE ECO 10 (383)	1-9-78	SKN
3	ADD A1 ECO 39 (586) ATD	9-8-78	R/L.
4	P/L CHNG ECO 38 (823)	11-2-78	R/L
5	DEL. CR17 FROM P/L ECO 41 (891)	11-21-78	R/L

REPAIR

OCT 22 1979

2. ADD ASSEMBLY A1 AFTER WAVE SOLDER.

1. ◉ DENOTES LARGE MALE QUICK DISCONNECT. (6 PLACES)

NOTES

TITLE
DIALING HOLD CIRCUIT BD. ASS'Y 96814.

NORTHEAST ELECTRONICS
CONCORD, NEW HAMPSHIRE U.S.A.

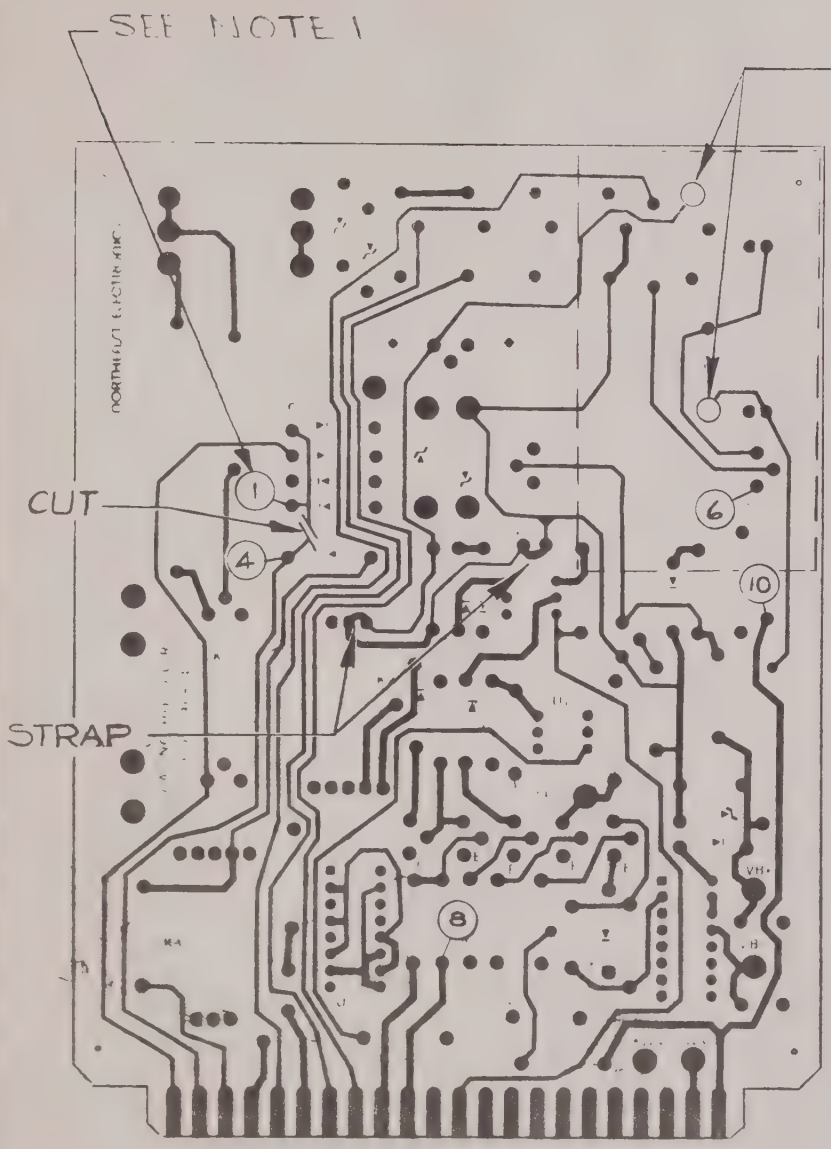
~~FINISH — ETCH AND IRIDITE~~
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~
~~R AND S VINYL 8050, W24~~

~~MATERIAL~~
~~ALUMINUM~~
~~5052 H34~~
~~3003 H14~~

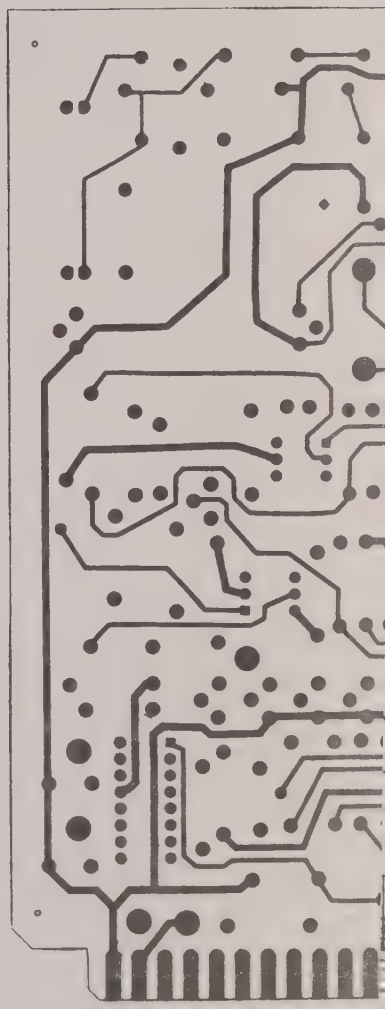
~~SCREEN PER~~ SCHEMATIC 0041-13-319

DRAWN MCF	DATE 3/17/77	SCALE 1/1
CHECKED [illegible]	DATE 7-13-77	
APPROVED SKN	DATE 7-21-77	

SIZE	NUMBER	ISS
B	0041-13-019	5



FRONT VIEW

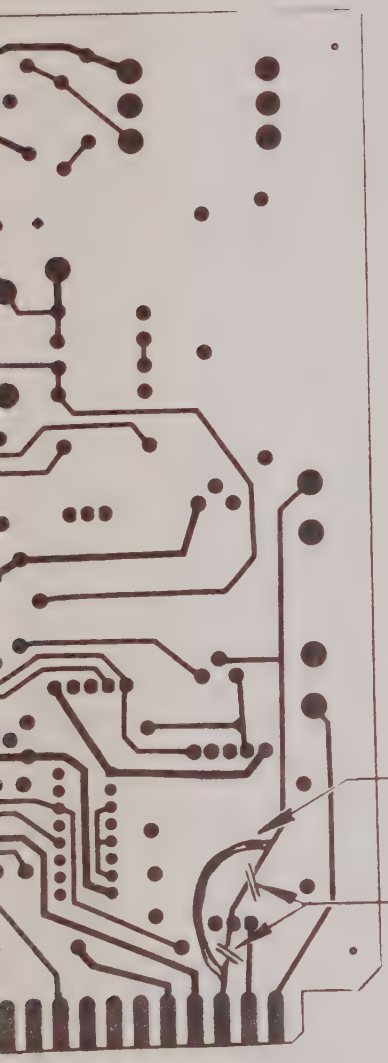


REAR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .01
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MATL .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS

NO	DESCRIPTION	DATE	APPROVED
3	REWORK % 33 (586)	9-8-78	R/L
4	P/L CHNG % 38 (823) APM	11-2-78	RJL.
5	DEL. CR17 FROM P/L % 41 (891) CDB	11-21-78	RJL



VIEW

REPAIR

OCT 22 1979

1. CIRCLED NUMBERS DENOTE WIRING POINTS FOR A I.

NOTES

TITLE

DIALING HOLD CIRCUIT
BD. ASSY 96814

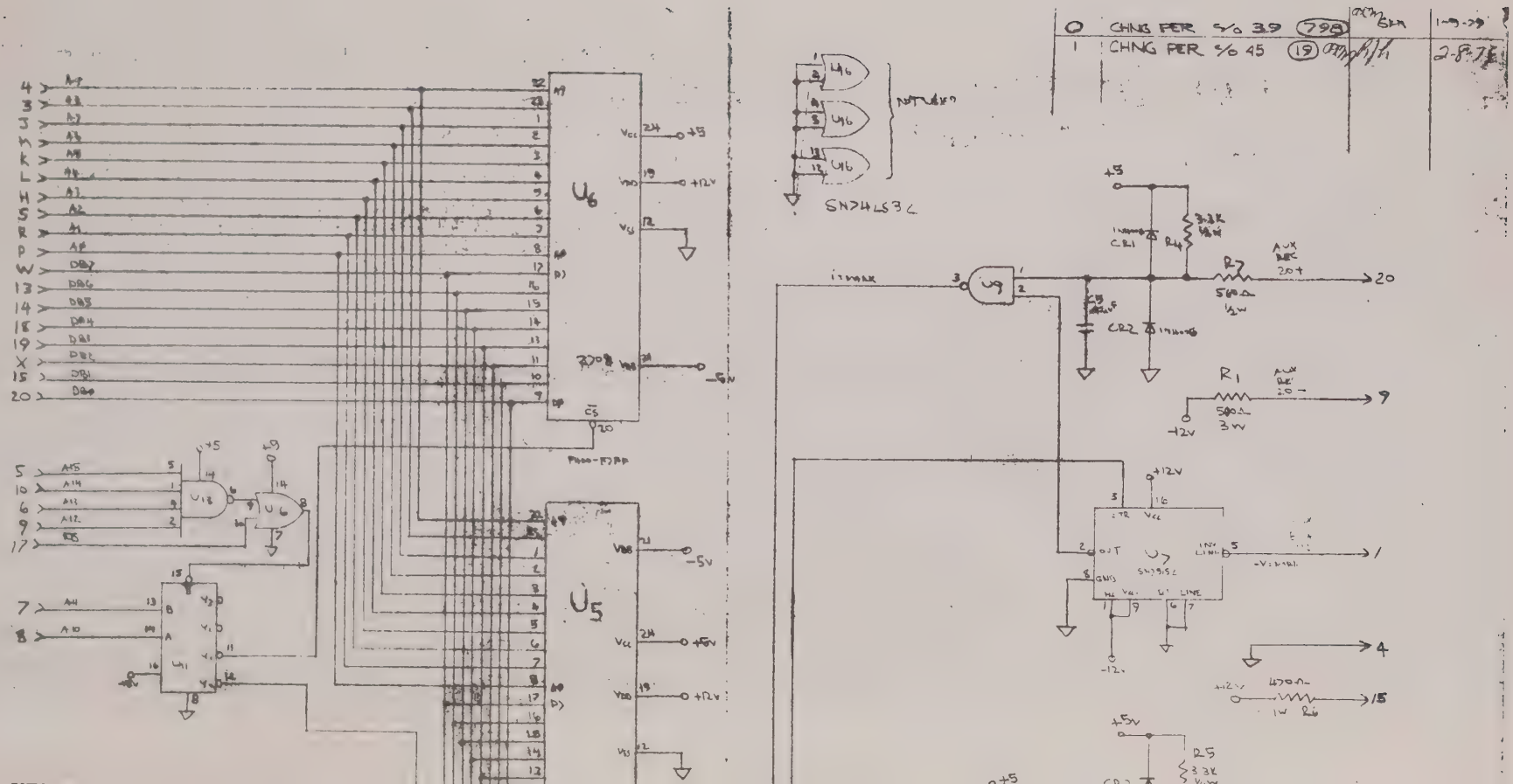
FINISH — ETCH AND IRIDITE	MATERIAL
PAINT — FEDERAL SPEC. 595 COLOR 26492	ALUMINUM 5052 H34 3003 H14
R AND S VINYL 8050, W24	
SCREEN PER	

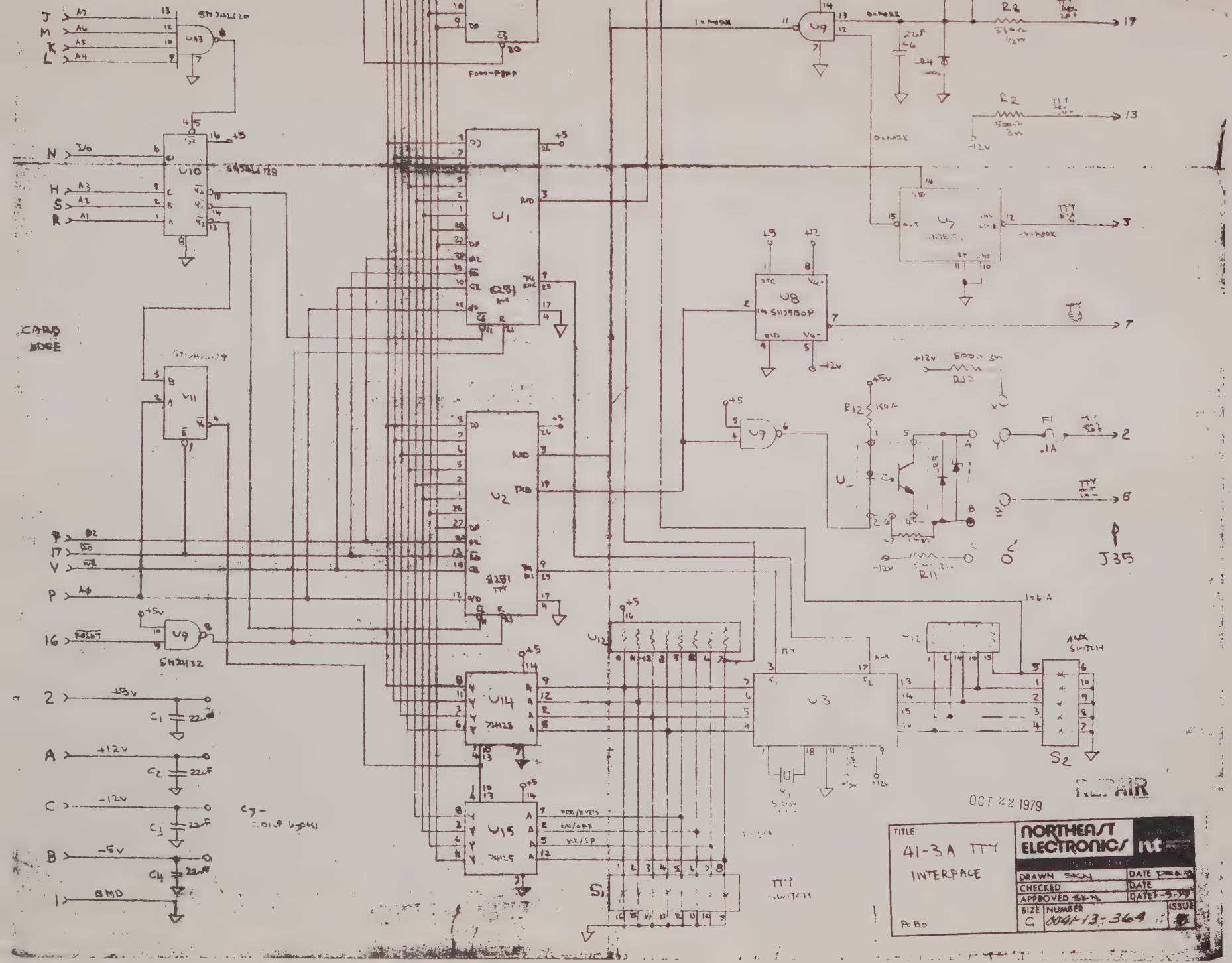
NORTHEAST ELECTRONICS int

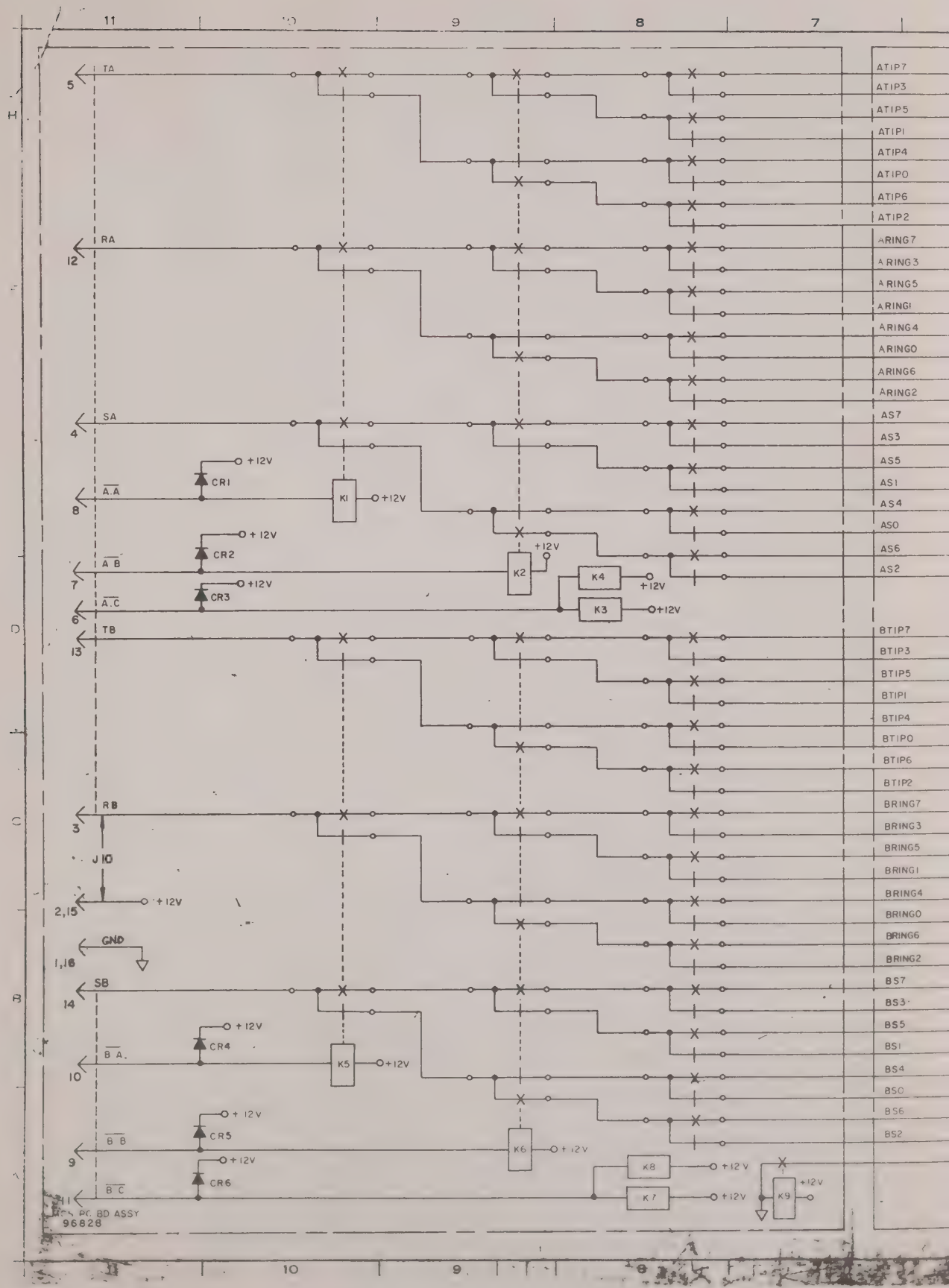
ONCOR NEW HAMPSHIRE U.S.A.

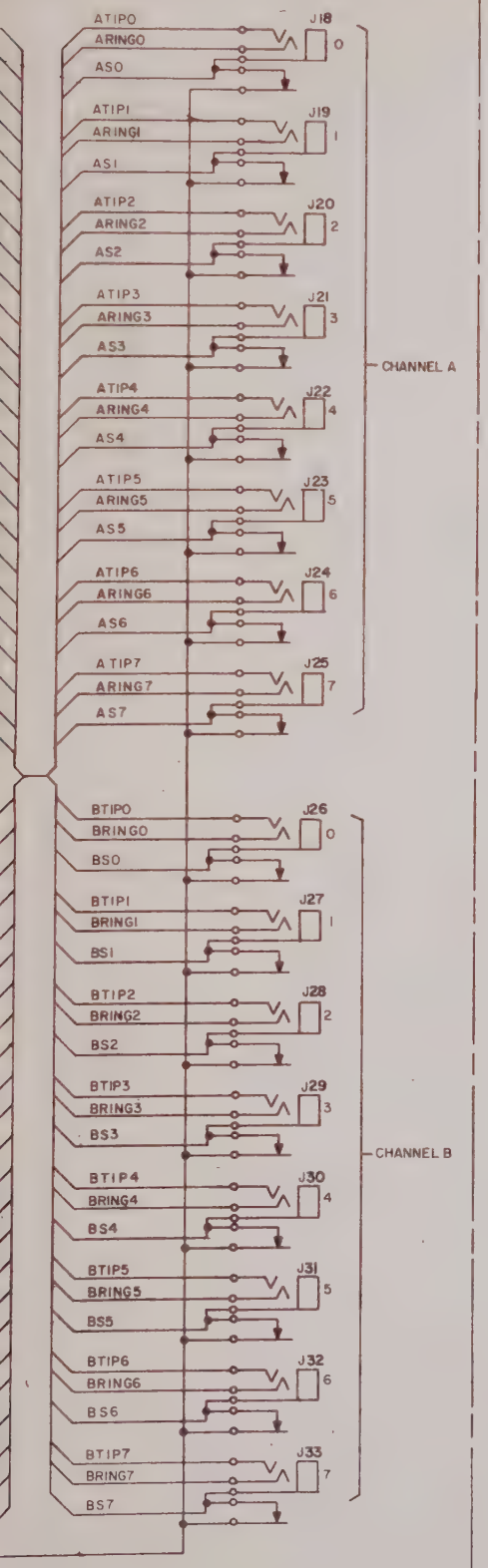
DRAWN LD	DATE AUG 29. 78	SCALE ——
CHECKED		DATE 8-25-78
APPROVED		DATE 9-8-78

SIZE	NUMBER	ISSUE
B	0041-13-019	5


0 CHNG PER S/O 39 (798)
1 CHNG PER S/O 45 (19)
U6
U5
U9
U7
U8
U18
U16
U17
U46
SN74LS37
SN74LS32
SN74LS157
R1
R2
R4
R5
R6
R7
CR1
CR2
C5
+5
+12V
-5V
-12V
20
7
1
4
15
Phase-F/F


CARD EDGE
U1
U2
U3
U7
U8
U9
U10
U11
U12
U14
U15
S1
S2
J35
R2
R8
R11
R12
C1
C2
C3
C4
C6
C7
+5V
+12V
-12V
-5V
GND
TTY SWITCH
1=MARK
DAMARK
OCT 22 1979
REPAIR
TITLE
41-3A TTY INTERFACE
NORTHEAST ELECTRONICS
DRAWN
CHECKED
APPROVED
SIZE C
NUMBER 004-13-364
ISSUE


11
10
9
8
7
TA
RA
SA
A A
A B
A C
TB
RB
J10
GND
SB
B A
B B
B C
+12V
CR1
CR2
CR3
CR4
CR5
CR6
K1
K2
K3
K4
K5
K6
K7
K8
K9
ATIP7
ATIP3
ATIP5
ATIP1
ATIP4
ATIP0
ATIP6
ATIP2
ARING7
ARING3
ARING5
ARING1
ARING4
ARING0
ARING6
ARING2
AS7
AS3
AS5
AS1
AS4
AS0
AS6
AS2
BTIP7
BTIP3
BTIP5
BTIP1
BTIP4
BTIP0
BTIP6
BTIP2
BRING7
BRING3
BRING5
BRING1
BRING4
BRING0
BRING6
BRING2
BS7
BS3
BS5
BS1
BS4
BS0
BS6
BS2
96828



REVISIONS			
NO	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL RELEASE	4-22-79	SLM
1	CLEANED UP PRINT % 42 (832)	[illegible]	[illegible]

OCT 22 1979

REPAIR

NOTES: 1. CR1 - CR6 ARE IN 4006.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

TITLE
SCHEMATIC DIAGRAM
MCS PC BD ASSEMBLY 96828

FINISH — ETCH AND IRIDITE
PAINT — FEDERAL SPEC. 595 COLOR 27899
R AND S VINYL 8050, W34
SCREEN PER

MATERIAL
ALUMINUM
~~5052 H34~~
3003 H14

NORTHEAST ELECTRONICS CORPORATION
CONCORD, N.H., U.S.A.

DRAWN ANTAL | DATE | SCALE
CHECKED | DATE
APPROVED SLM | DATE ~~4-22-79~~

SIZE D | NUMBER 0041-[illegible]

TALK

TRACE 2 REQ.

TEST 2 REQ.

EXT

DELAY

DIAL TONE

OPEN C-LEAD

REV. DRNG-DIAL

AUS SUP

1KHZ TONE

INC CKT

FAULT

REORDER

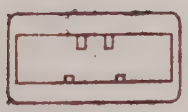
R or B + ANSWER

BUSY

MANUAL

UNLESS OTHERWISE SPECI DIMENSIONS ARE IN INCI
ALL TOLERANCES ARE ±
ALL BENDS ARE 90° ± ½
BEND RADIUS AS FOLLO MAT'L .09 OR LESS, 1/64 I MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDG DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	[illegible]	9-22-77	[illegible]



LEGEND READS
RIGHT WHEN BUTTON
IN THIS POSITION.

REPAIR

OCT 22 1979

2. ALL LETTERING BLACK

1. ONE BUTTON OF EACH REQUIRED UNLESS OTHERWISE SPECIFIED.

NOTES

TITLE

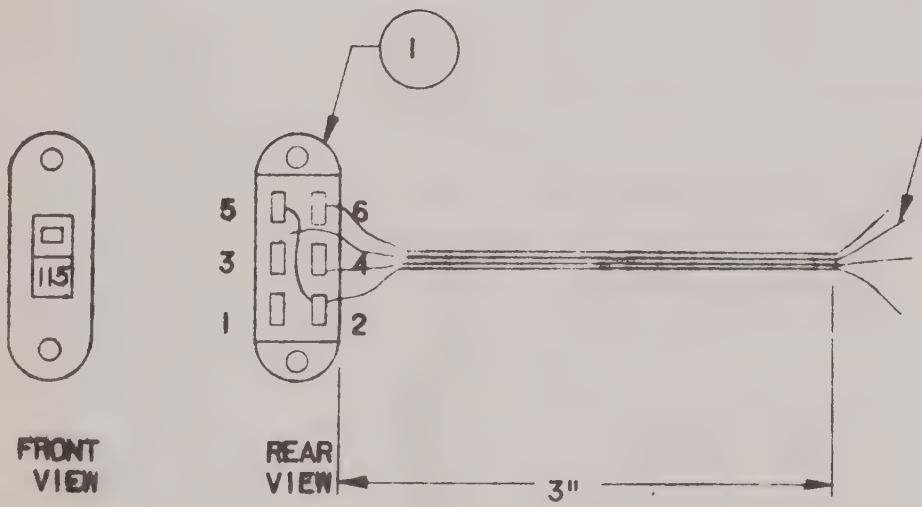
PUSHBUTTON ENGRAVING ASS'Y

NORTHEAST ELECTRONICS nt
CONCORD, N.H.

~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN MCF	DATE 6/6/77 SCALE 4
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34 3003 H14~~	CHECKED [illegible]	DATE 7/21/77
~~R AND S VINYL 8050, W24~~		APPROVED SKN	DATE 7-21-77
~~SCREEN PER~~		SIZE B	NUMBER 0041-13-052 ISSUE 0

SEE NOTE 1

WIRE LIS		
COLOR	FROM	TO
YEL	S48-5	S4
RED	S48-3	PS
ORG	S48-4	PS
YEL	S48-2	PS
GRN	S48.6	PS



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

BRUNING 40-105 28093-1

	LENGTH
48-2	1.00"
SU2.1	3.50"
SU2.3	3.50"
SU2.2	3.50"
SU2.4	3.50"

'2"

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE	9-22-77	SKN
1	REMOVED TIES S/O 12 (369)	1-3-78	

OCT 22 1979

REPAIR

1. PSU2 ATTACHED AT LATER WORK CENTER.

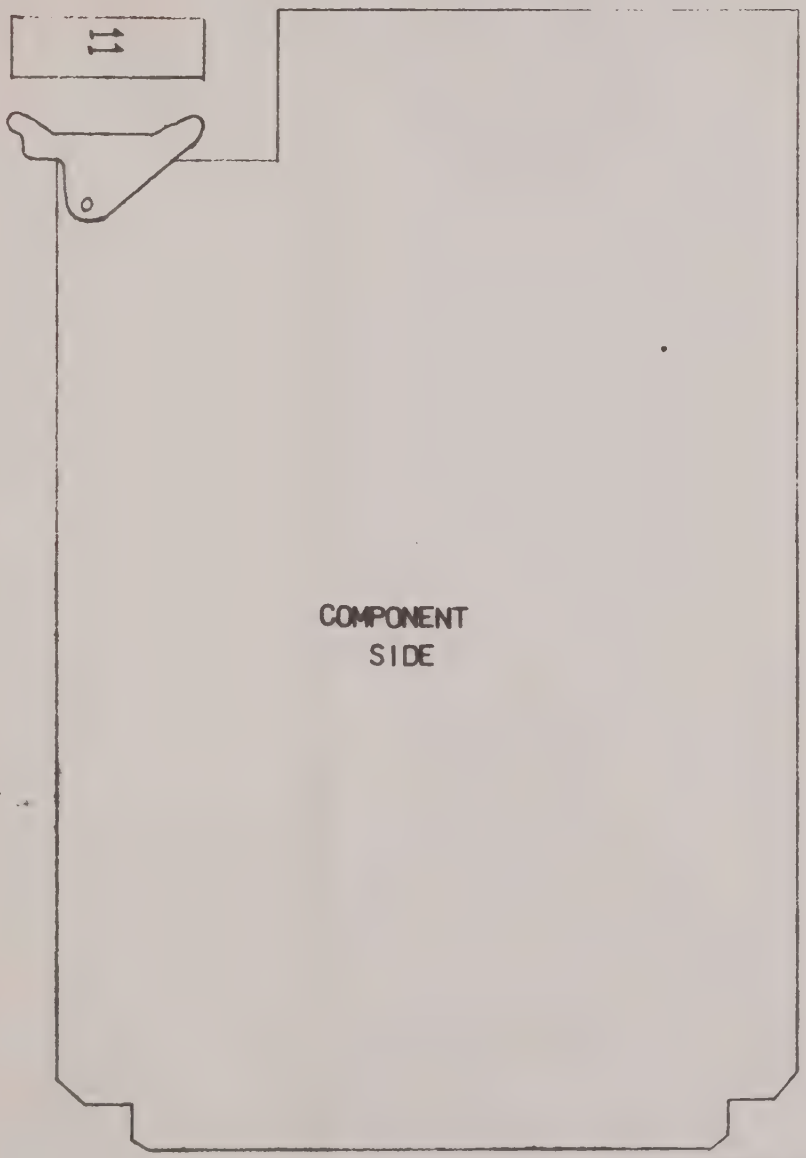
NOTES

TITLE

SWITCH ASSY. S-48

NORTHEAST ELECTRONICS INT
CONCORD, NEW HAMPSHIRE U.S.A.

FINISH — ETCH AND IRIDITE	MATERIAL	DRAWN	DATE 8-10-77	SCALE 2
PAINT — FEDERAL SPEC. 595 COLOR 26492	ALUMINUM 5052 H34 3003 H14	CHECKED SKN	DATE 8-10-77	
R AND S VINYL 8050, W24		APPROVED SKN	DATE 8-10-77	
SCREEN PER		SIZE B	NUMBER 0041-13-058	ISSUE 1



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
ALL TOLERANCES ARE ± .015
ALL BENDS ARE 90° ± ½°
BEND RADIUS AS FOLLOWS MAT'L .09 OR LESS, 1/64 RAD MAT'L .125, 3/32 RAD
BREAK ALL SHARP EDGES DEBUR ALL HOLES SAND ALL SURFACES WITH FINE GRIT

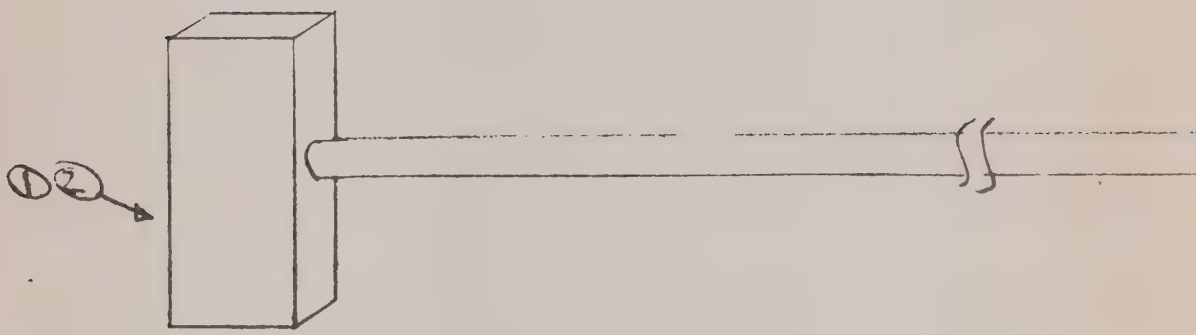
REVISIONS			
NO.	DESCRIPTION	DATE	APPROVAL
0	ORIGINAL ISSUE c/o #IY (473)	3-29-78	R.S.L.
1	NEW P.C. BD % 39 (798)	1-9-79	S.K.N.

OCT 22 1979

REPAIR

TITLE: 41-3A TTY CARD		NORTHEAST ELECTRONICS CORPORATION CONCORD, N.H., U.S.A.	
~~FINISH — ETCH AND IRIDITE~~	~~MATERIAL~~	DRAWN SKN	DATE 1-25-79 SCALE —
~~PAINT — FEDERAL SPEC. 595 COLOR 26492~~	~~ALUMINUM 5052 H34 3003 H14~~	CHECKED SKN	DATE 11-22-79
~~R AND S VINYL 8050, W24~~		APPROVED SKN	DATE 11-22-79
~~SCREEN PER~~		SIZE B	NUMBER 004113-067 ISSUE 1

P1 STATION 1

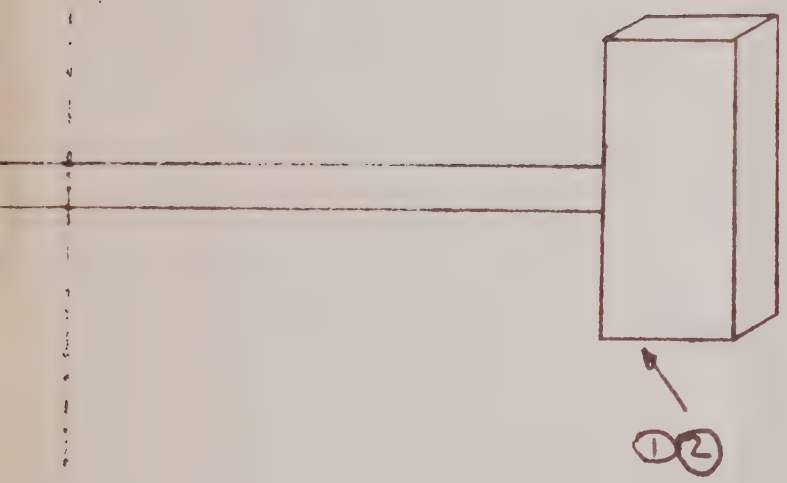


COLOR	FROM	TO	STA	STA	GA	LENGTH
blk	P1.1	P2.1	1	2	22	8 ft
RED	P1.2	P2.3	1	2		
GRN	P1.3	P2.2	1	2		
red	P1.4	P1.5	1	1		1"
yel	P2.5	P2.4	2	2		1"
ORN	P1.6	P1.8	1	1		1"
ORN	F1.8	P .20	1	1		2"
GRN	F2.20	P2.8	2	2		2"
GRN	P2.8	P2.6	2	2		1"
WHT	P1.7	P2.7	1	2		8 ft

NOTE: C

C REL [illegible] (153) SKN

P2 STATION 2



OCT 22 1979

E IS BELDEN 8444

REPAIR

TITLE: STATIC NULL PROBLEM	NORTHEAST ELECTRONICS CORP. U.S.A.
	DRAWN SKN — DATE 6-5-78
	CHECKED — DATE
	APPROVED — DATE
	SIZE B — NUMBER [illegible] — ISSUE